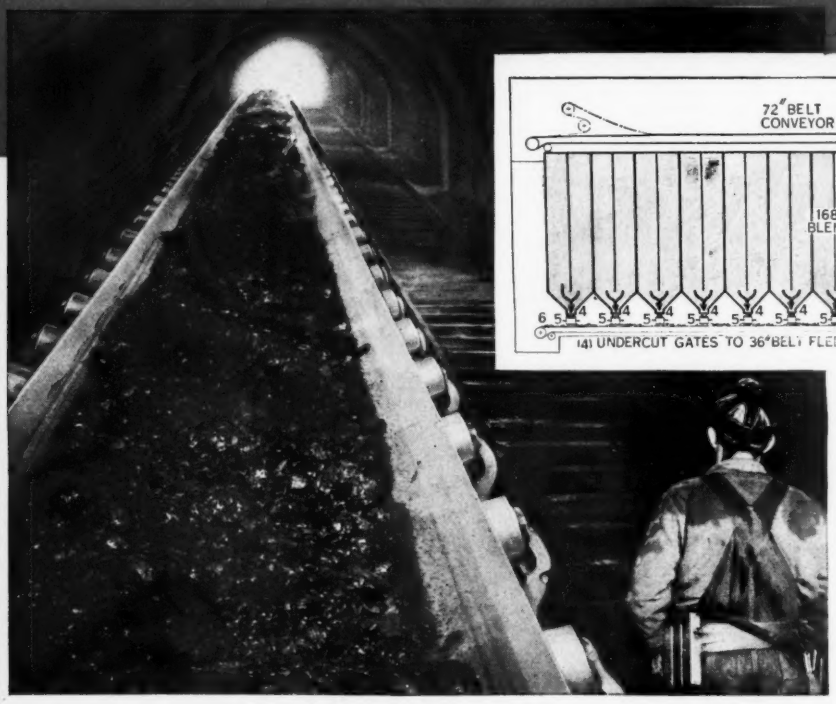
Mining CONGRESS JOURNAL

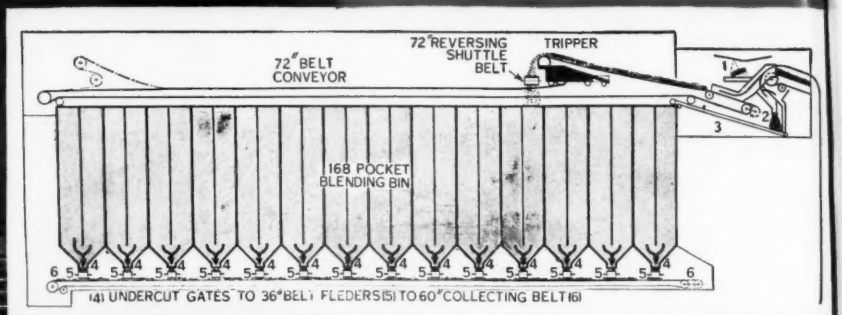
THE AMERICAN MINING CONGRESS

JANUARY 1949

resenting—EVOLUTION OF MODERN COAL MINING

The Longest↔highest lift↕widest belt conveyors in Coal Mining





Part of the Link-Belt conveyor equipment at the world's largest coal mine—Robena Mine of H. C. Frick Coke Company. Shown above is the blending bin with a 72" wide Link-Belt conveyor for distributing coal over the 168 pockets of this bin.

Continues the trend towards continuous coal flow

Pardon the superlatives, but we can't resist the temptation to brag a little about the new heights attained by the technology of the American coal mining industry.

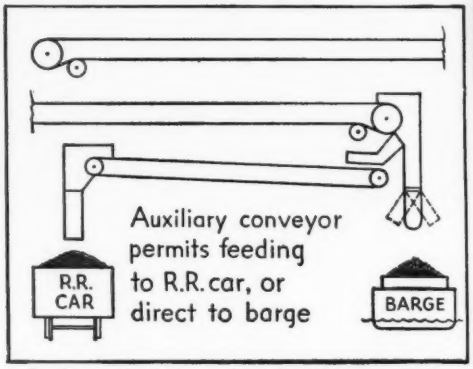
Link-Belt has installed, or is installing, the following in coal mining operations:

1) The longest belt conveyor (10,900 ft.). This is an installation soon to be made for a metallurgical coal mine in West Virginia.

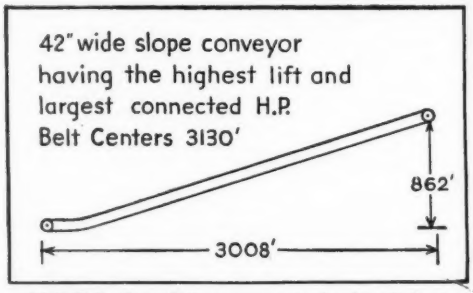
2) A belt conveyor with the highest lift (862 ft.), for a Southern Illinois mine.

3) The widest belt conveyor (72" belt) at the world's largest coal mine—Robena Mine of H. C. Frick Coke Company.

The success of Link-Belt conveyor installations in raising production rates and cutting handling costs is due not only to the most advanced design and construction of Link-Belt manufactured components, such as carrying and return idlers, terminal and drive machinery, welded steel pulleys, and highly efficient speed reducers, but to broad engineering experience in integrating these elements most effectively.



Loading and delivery ends of 10,900 ft. long Link-Belt conveyor which will carry coal at the rate of 216 T.P.H., from mine, through tunnel to river at a West Va. mine.



Link-Belt slope belt conveyor to be installed at Southern Illinois mine.

LINK-BELT COMPANY

Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington, W. Va., Denver 2, Kansas City 6, Mo., Cleveland 13, Indianapolis 6, Detroit 4, St. Louis 1, Seattle 4, Toronto 8. 11,307

COAL PREPARATION AND HANDLING EQUIPMENT

Engineered, Built and Backed by LINK-BELT

America's FIRST Drop Bottom Mine Car...
NOW, COMPLETELY DUST SEALED!

America's FIRST Drop Bottom Mine Car, the S-D "Automatic", has maintained its leadership by being the FIRST consistently to bring its users the newest money-saving, time-saving features. Now, we offer you S-D "Automatics" completely sealed against dust leakage. A dust-proof seal bridges the space between the door and the car frame, carrying the coal dust over into the bottom of the car so that it can't dribble out and accumulate on the tracks. Special coverings protect the axle openings and provide a positive seal at that point. Dust on the tracks is often a dangerous condition and removal or clean-up is a costly operation running over $10,000 annually in many mines. Many far-sighted operators have already started replacing their old cars with S-D "Completely Sealed Automatics" and are working toward the day when their mines will be completely dust-free.

With S-D "Sealed Automatics" you get the same big capacity, the same automatic 1-2-3 dumping that lays the coal down gently but rapidly with minimum breakage. You get our improved long-life construction and our foolproof "Jerk-Out" unlatching device that operates underneath the car. You get all of the features that have made S-D "Automatic" America's FIRST Drop Bottom Mine Car, plus this revolutionary "Completely Sealed" feature that makes the S-D "Automatic" the greatest money saving car the industry has ever known.

20 Car loads of "Automatics" from—

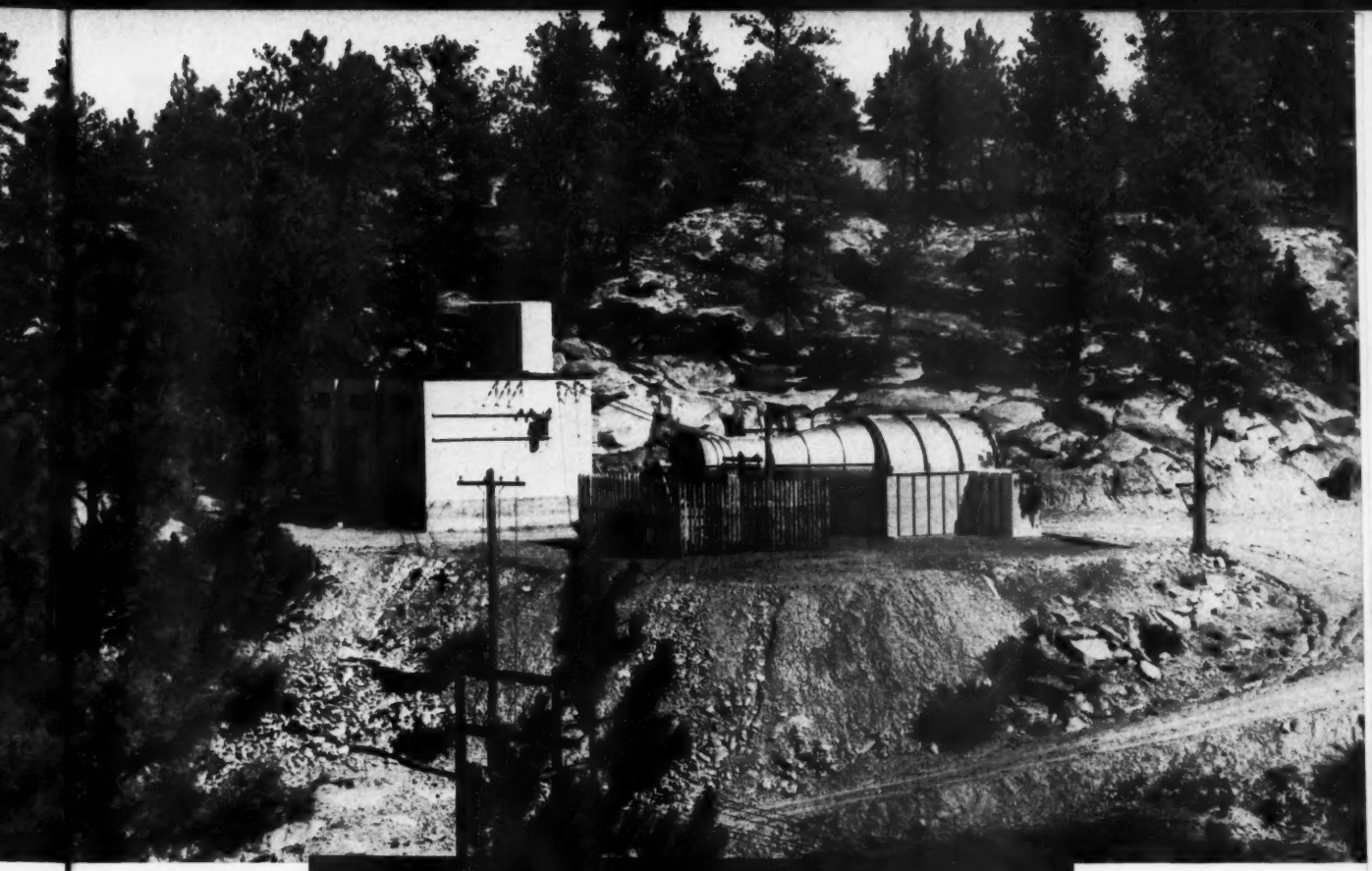
SANFORD-DAY IRON WORKS, Inc. • Knoxville, Tenn.

JEFFREY AERODYNE FANS

WE TAKE NO CHANCES

fresh air underground is important. The men working down u... know it . . . so do Jeffrey engineers who make it their business to see that your fans are equipped to provide an abundance of fresh air *at all times*. On this page you see some different combinations of set-up . . . all with one purpose . . . to keep your Fan No down time . . . no lack of fresh air when and ... dust . . . no chances are taken when a ... auxiliary power unit is on the job.

Jeffrey engineers will be glad to suggest the proper ... equipment ... the auxiliary power unit for add... safety. Call ...



Drills — Cutters
Locomotives
Shuttle Cars

Mine Conveyors
Loaders — Jigs
Fans and Blowers

THE JEFFREY MANUFACTURING COMPANY

958 North Fourth Street, Columbus 16, Ohio

Sales Offices:	Baltimore	Chicago	Denver	Jacksonville	Pittsburgh
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- **Drill Faster!**
- **Last Longer!**
- **Cost Less!**

Smooth, straight holes drilled with Kennametal bits cost less, save time, and reduce maintenance expense. Compared to other types of bits used for the same purpose, they require less power to drive . . . stay sharp much longer. The tough, hard Kennametal tip stands up longer; has high resistance to abrading, bending, or failing.

It's no wonder Kennametal drill bits have moved up so rapidly among mine operators. For, in addition to fast, low cost drilling in coal, they have the strength and hardness to drill through hard rock and slate.

You can't be handicapped by slate or bony "partings" when you drill with Kennametal. Its sharp, hard edge "bites" in quick, drills right through the rock—ordinarily it's no more difficult than drilling coal.

Kennametal-drilled holes are clean, single-gage—the charge has maximum effectiveness, which results in better breakage and fewer loading difficulties.

Before you buy drill bits, think what these advantages mean to you. For more information write the Mining Division, Kennametal Inc., Latrobe, Pa.

Fast Drilling

The average drilling speed with Kennametal is usually up to 50% faster than with any other type of bit. Abrasion-resistant Kennametal (thought of as the hardest metal in coal mining) remains sharp over long periods of drilling.

Long Service

Data collected in mines all over the country show that it pays to have bits that last the longest. It saves labor cost in terms of handling, changing, and sharpening. Some mines report that these features alone more than pay for the extra cost of Kennametal bits. Kennametal bits commonly last longer than 500 ordinary steel bits.

Low Bit Cost

Many mines report bit cost reductions of as much as 50% before Kennametal bits are dull. Since they can be sharpened many, many times before they are worn out, the bit cost should be reduced even more in many, many instances.

Low Maintenance Cost

Whenever a bit dulls or breaks it loads the drill. Loads cause the drill to overwork. Sooner or later the drill goes off the job, into the maintenance shop. Winding costs are high. Extra drills are needed if too many wear out or burn up at one time. Kennametal drill bits are your protection against these problems. They operate at 25% to 50% less amperage.

What is Kennametal?

Kennametal is the name of a very hard, durable tool material that was developed by Philip M. McKenna, the president of Kennametal Inc. This new metal is made of powdered particles of various metals, such as tungsten carbide, cobalt, and sometimes tungsten-titanium carbide. In the fine-ground stage it takes 18,000,000,000,000,000 particles to fill an average-size sewing thimble. The powdered particles are formed into Kennametal solids by sintering the pressed ingredients together in special electric vacuum furnaces. In its solid state it has the best combination of strength, hardness, shock-resistance and rigidity of any metal processed by this method. Kennametal is called cemented carbide in industry, but it is distinctive from other carbides either by the process and/or the ingredient that is used to manufacture it.

KENNAMETAL

THE WORLD'S LARGEST MANUFACTURER
OF CEMENTED CARBIDE MINING TOOLS

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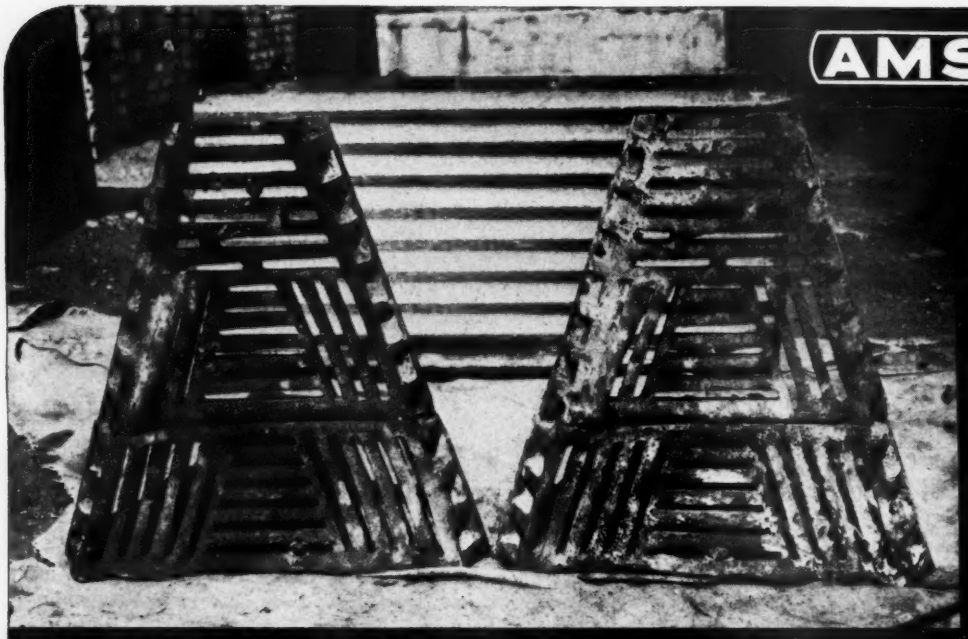


Unretouched illustration of Amsco special manganese steel grates . . . after handling 193,797 tons of gold bearing quartz rock in ball mill.

BALL MILL GRATES

after 193,797 tons

Where operations involve impact and abrasion, you will find Brake Shoe facilities a sure source for wearing parts that will stand up longer . . . to give you important reductions in operation cost.

A case in point is the grates used in ball mills. In one application Amsco special manganese steel grates handled a total of 193,797 tons of gold bearing quartz rock . . . without requiring repair of any kind. In addition, slot peening and "blinding" were so little that an acceptable grind was obtained throughout the operating period. In another comparable installation, with Amsco special manganese steel grates, a total of 176,360 tons of quartz rock was handled at a cost of $0.00369 per ton. An important factor was demonstrated here also: while the previous grates gave a 136,923 ton service life, repair was required during this period totalling 29¼ hours; this lost time cost an estimated $200.00 per hour in lost tonnage.

The reason for such outstanding performance with Amsco parts is threefold: (1) Brake Shoe metallurgical research in manganese steel and other alloys makes possible the selection of the best steel or iron to cope with the specific job conditions; (2) Amsco application experience supplementing that of the mill operator often results in design improvements that alone can greatly lengthen operating life; and (3) Amsco foundry practice produces castings with uniform grain structure and dimensional accuracy.

If you think that your mill grates, liners or feeder lips are costing you too much per ton of ore ground, we may be able to help in the solution of your problem. All uses for Amsco alloy steels in metal mines and mills are described in Bulletin 743-M.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
CHICAGO HEIGHTS, ILL.

Foundries at Chicago Heights, Ill., New Castle, Del., Denver, Colo., Oakland, Calif., Los Angeles, Calif., St. Louis, Mo.
Offices in principal cities. In Canada: Joliette Steel Limited, Joliette, Que.

You Have The Rock

We Have The BIT

Get them together and you will have the formula for greatly reduced drilling costs. It doesn't matter what kind of rock it is; there's a Timken Rock Bit to match and master it—including a carbide insert bit.

What makes the Timken Bit superior for rock drilling? (1) a removable principle that has proved its correctness by more than 14 years service under all rock drilling conditions in mines and construction work. (2) Timken Steel developed especially for Timken Rock Bits and produced in our own steel plant. (3) Timken metallurgical "know how" in heat treatment and hardening. (4) uniform quality and performance; every Timken Bit will give the same outstanding service in speed of penetration and depth drilled when used in the same kind of rock.

No matter where you are there's a Timken Rock Bit distributor within telephone call. Conversion and reconditioning shops also are conveniently located for quick service. Put Timken Bits to work now—cut drilling costs, increase production.

THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO
CABLE ADDRESS "TIMROSCO"

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
ROCK BITS

Cummins Diesels Save Fuel

Compare the cost! **Operate a Cummins Diesel alongside other engines—diesel, gasoline, or butane—then check your fuel bills. Here's what our customers report:**

Annual Savings: $2620.00

Yearly fuel costs for a Cummins-powered truck used on an off-highway haul, consisting of three 22-mile round trips per day, are $2620.00 less than the fuel costs for a gasoline-powered truck used on the same haul. That's because the Cummins-powered truck shows a daily fuel cost of $3.47 against $13.55 per day for the gas job.

Annual Savings: $1138.80

Yearly fuel costs for a Cummins-powered earth mover on a multi-million-yard earth-moving project are $1138.80 less than the fuel costs for an earth mover powered by another make of diesel and doing similar work. That's because the Cummins-powered unit, while making more trips and carrying heavier loads, uses only 25.7 gallons of fuel per shift against 33.5 gallons per shift for the other diesel.

For a complete explanation of the Exclusive Cummins Fuel System and how it can cut your fuel bills, write Cummins Engine Company, Inc., Columbus, Ind., for Bulletin 5275.

CUMMINS ENGINE COMPANY, INC. • COLUMBUS, INDIANA

Robins Gyrex Screen gives thrifty, dependable service on same installation since 1933

For more than 15 years the Robins Gyrex Screen pictured above has given low-cost service at the Mohawk Mining Co., Kittanning, Pa.

"It just runs on and on!" says D. H. Turner, Mohawk president.

Such long service is typical of what you can expect from Robins Gyrex Screens. You can use them for a wide variety of sizing or separating jobs—for coal, coke, gravel, stone, sand, rock, ore and many bulk materials.

Developed by Hewitt-Robins, the Gyrex vibrating screen is extremely versatile. It can separate as many as six different sizes at one time. It can size anything from fine hair to coarse rock. And it can handle hundreds of tons of bulk material every hour.

Once *you* install a Gyrex Screen, you will soon discover these five advantages:

1. Smooth operating. Has powerful vibration within itself. Yet *does not vibrate* the building or supports.

2. Versatile. Available in a weight to meet any class of service—a size to solve every problem. More than 300 models and styles.

3. Economical. Uses minimum of power per ton of material screened.

4. High capacity and efficiency. Uniform positive motion and correct centrifugal action.

5. Long life, low maintenance cost. All bearings super-sealed. All permanent connections electric-welded. All service connections jig-drilled for fitted bolts.

ROBINS

GYREX SCREENS

Consult Robins now. There's a Gyrex Screen to meet *your* exact needs.

SEND TODAY for Robins Bulletin No. 115-A. Fully illustrates and describes features, advantages and benefits of efficient Gyrex Screens. Address Robins Conveyors Division, 270 Passaic Avenue, Passaic, New Jersey.

ROBINS CONVEYORS DIVISION **HEWITT-ROBINS INCORPORATED**

POWERFUL Workhorse-

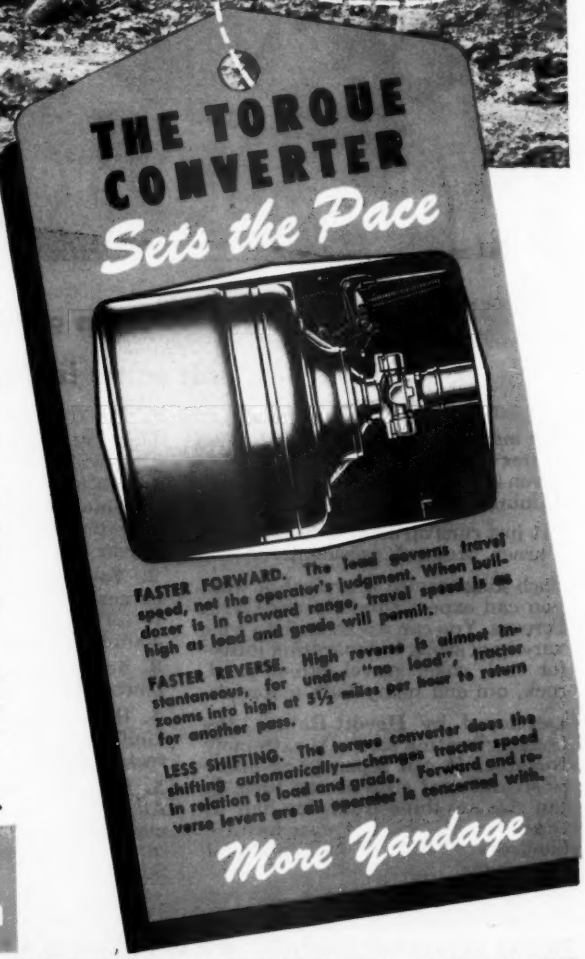
THE TOUGHER THE JOB THE MORE YOU NEED A BAKER

Here's a rugged "he-man" outfit that can take a real beating and "dish it out" in return. The sensational performance of the giant Allis-Chalmers HD-19 teamed up with the Baker Hydraulic Bulldozer has rocked the entire earthmoving industry — set a new high in production — a new low in cost. Compare the Baker with any bulldozer on the market — you get direct lift; direct down pressure; engine mounting, 5-position adjustable blade tilt; interchangeable bulldozer or grade-builder blades; blade pitch adjustment; smooth, fast, dependable hydraulic control, plus extra rugged construction which has made Baker famous throughout the world.

Mounted on an HD-19 you've got an unbeatable bulldozing team — speed, power, traction and over 48,000 lbs. of fighting weight. Your best bet is Baker. See your Allis-Chalmers Baker dealer now.

BAKER MFG. CO., SPRINGFIELD, ILL.

BAKER



BULLDOZERS • GRADE BUILDERS • SNOW-PLOWS

BUILT TO DELIVER
MORE TONS PER CABLE

"SECURITYFLEX" has grown to mean *leadership* in mine cable as a result of . . .

Anti-short breaker strip between conductors (available in cable with or without grounding wire) . . . crush resistance . . . special heat resistant insulation . . . rugged neoprene jacket that resists flame and abrasion . . . non-kinking construction . . . assurance of more continuous service. All this means *more tons per cable.*

Securityflex meets all requirements of the U. S. Bureau of Mines Flame Test and diameter specifications. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

NEW DESIGN GIVES LONGER SHUTTLE CAR SERVICE

Shuttle car service demands a cable that can take it. The inherent advantages of Securityflex Parallel Mine Cable, coupled with a recent improvement in design that greatly reduces grounding wire failures, make this cable more suitable than ever for shuttle car use. You will find this parallel mine cable gives longer, safer operation under the extreme cable tensions encountered in shuttle car service.

45475

ANACONDA *Securityflex** **MINE CABLE**

ANACONDA
from mine to consumer

*An Anaconda Trade-Mark

No More "Dry Runs"

New Gardner-Denver
Automatic Line Oiler
Safeguards Rock Drill Lubrication

Here's positive protection against running rock drills without adequate lubrication. When all the oil in the new Gardner-Denver L012 Automatic Line Oiler has been used, air in the line automatically shuts off. Consequently, *there is absolutely no chance for drills to run when dry.* A carefully metered flow of atomized oil assures smoother lubrication with lower oil consumption—increases the operating efficiency of all air actuated equipment. Here are other valuable L012 features:

OPERATES IN ANY POSITION — L012 Line Oiler operates equally well in any position, either vertically or horizontally.

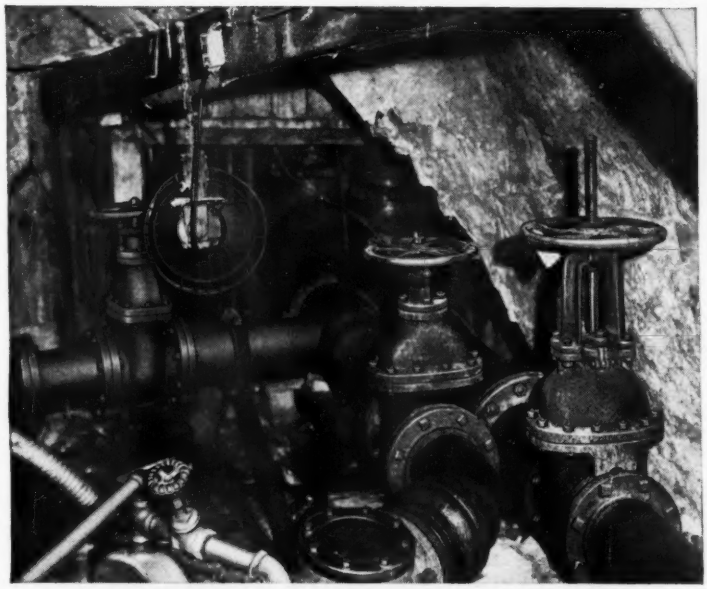
USED WITH A WIDE RANGE OF TOOLS — L012 will lubricate any pneumatic equipment using from 25 to 500 cubic feet of air per minute.

EASY TO REFILL — it is not necessary to shut off live air in order to refill the L012 Line Oiler.

For complete information, write Gardner-Denver Company, Quincy, Illinois

GARDNER-DENVER Since 1859

Everything in piping for mines ...on one order to CRANE



DRAINAGE LINES *in a metal mine featuring Crane valves and fittings. For dependable control . . . for complete selection . . . standardize on Crane.*

—and that includes all valves, fittings, pipe and pipe line accessories—for power, process or general service mine installations. One order . . . from one catalog . . . brings you the world's most complete selection of piping equipment, in brass, iron, steel and alloy materials. Crane Branches, strategically located for your convenience, are well stocked to supply your needs.

Many leading mines know the satisfaction and economy of standardizing on Crane. For the unequalled completeness of this **Single Source of Supply** simplifies every piping procedure, from design to erection to maintenance. You get better installations . . . avoid needless delays, when you put **Complete Responsibility** on Crane for materials. And for **High Quality** that makes for dependable piping performance, get Crane Quality, unsurpassed for more than 90 years.

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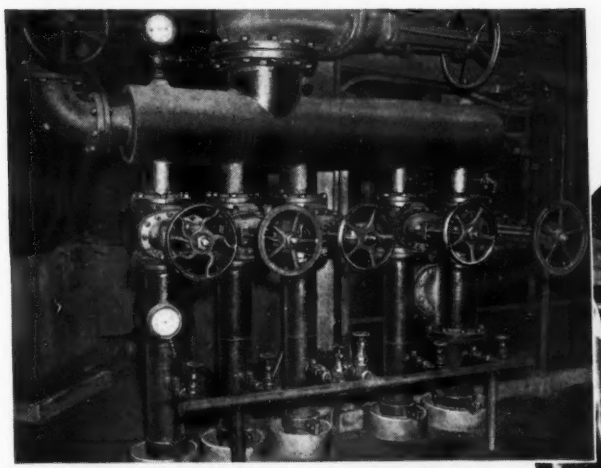
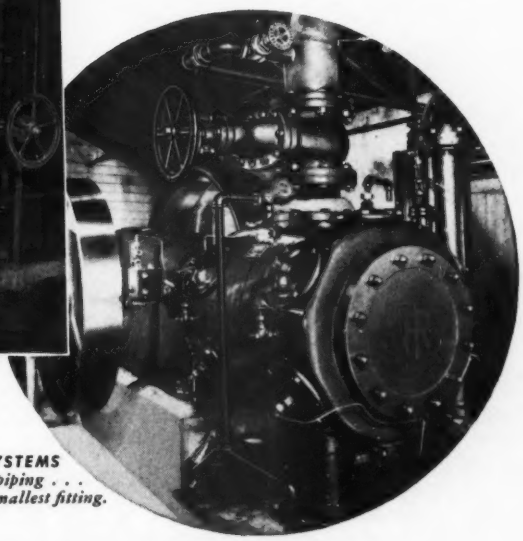
. . . RESPONSIBILITY
. . . STANDARD OF QUALITY



BREAKER PLANT *at a large coal mine. Crane equipment includes iron valves in piping to secondary cone, agitator ring and classifier.*



FOR AIR COMPRESSOR SYSTEMS
Crane supplies everything in piping . . . from the largest valve to the smallest fitting.

EVERYTHING FROM . . .

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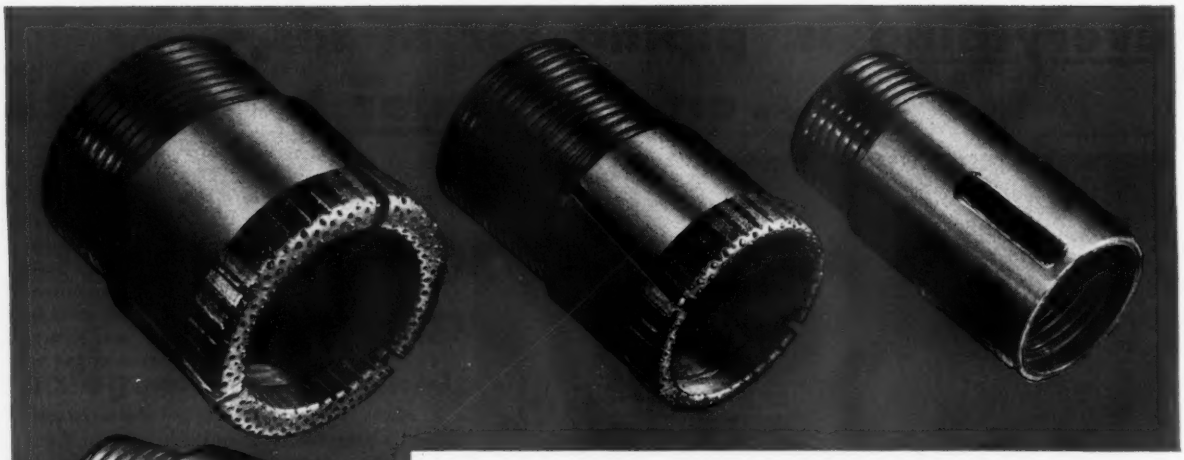
FITTINGS
PIPE

CRANE

PLUMBING
AND
HEATING

FOR EVERY PIPING SYSTEM



IN NEED OF
Diamond Bits?
Longyear can supply them

Drilling conditions vary with the kind of rock . . . hard or soft, tough or abrasive, friable, fractured or solid, or homogeneous.

Bit construction differs as to: 1) size and grade of diamonds, 2) type of matrix, 3) setting of diamonds; i.e., surface set, or impregnated.

For best results, your bits should suit the job. Qualified by years of experience, Longyear will aid in the right selection for your exploratory or blast hole drilling.

A complete stock of standard types and sizes of coring bits, casing bits, and reaming shells is maintained by Longyear. Special bits can be obtained on order.

Your Inquiries
Will Be Given Our Immediate Attention

We also carry in stock standard diamond drilling supplies, water swivels, hoisting plugs, core barrels, and other accessories.

E. J. LONGYEAR COMPANY

MINNEAPOLIS, MINNESOTA, U.S.A. NEW YORK OFFICE, 1775 BROADWAY

CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO, CANADA

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS

REPRESENTATIVES IN PRINCIPAL MINING CENTERS OF THE UNITED STATES AND OTHER COUNTRIES

Exclusive Safety Features of Du Pont Electric Blasting Caps

Coal mine operators almost everywhere approve the exclusive safety features of Du Pont Electric Blasting Caps. These include:

- **Nylon-insulated wires**—resist abrasion, will not crack when wires are half hitched. They're white for easy visibility.
- **Rubber plug closures**—are double-crimped into cap shells and are securely held. Caps are fully protected against moisture.
- **Aluminum foil shielded shunts**—available only on Du Pont Caps—provide protection against premature firing through accidental contact with an electric current. They short circuit the bared ends of the wires for their entire length.

Du Pont Electric Blasting Caps for coal mining are provided with iron wires to facilitate removal from broken coal by magnetic separators. Wires are of standard lengths: 4, 6, 7, 8, 9, 10 and 12 feet.

Ask any Du Pont Explosives representative for information about the features and use of these popular Electric Blasting Caps and the products listed in the adjoining column.

E. I. DU PONT DE NEMOURS & CO. (INC.)
EXPLOSIVES DEPARTMENT
WILMINGTON 98, DELAWARE

Listen to "CAVALCADE OF AMERICA"—*Monday evenings*—*NBC*

DU PONT EXPLOSIVES

(ELECTRIC BLASTING CAPS—"NITRAMON"—PERMISSIBLES BLASTING SUPPLIES AND ACCESSORIES)

Best Sellers in the field of permissibles

DU PONT "MONOBEL" AA
The most popular permissible on the market. A real producer of big lump coal. Excellent water-resistance.

DU PONT "GELOBEL" C
High velocity, gelatinous permissible recommended for hard rock work. Exceptional water-resistance makes it a splendid dynamite for the wettest operations.

DU PONT "LUMP COAL" C
The slow, heaving action of this widely used permissible pushes the coal away from the face so that mechanical loaders can readily handle it.

FOR EFFICIENT STRIPPING OPERATIONS
Du Pont "Nitramon"* blasting agent—the safest available—is ideal for coal stripping. Packed in watertight metal cans, it is easy to handle . . . easy to load, and may be safely loaded far in advance of firing time. Non-headache-producing . . . another important feature.

OTHER DEPENDABLE BLASTING SUPPLIES
Du Pont Rheostats
Du Pont Leading Wire
Du Pont Blasting Galvanometer
Du Pont Tamping Bags
Du Pont Connecting Wire

*Reg. Trade-mark for nitrocarbonitrate blasting agent.

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Nothing Succeeds Like Success!

Plant operators have proved the success of the

WKE (HMS) MOBIL-MILL

for five important uses:

1 COMPLETE PRODUCTION UNIT

for economic extraction of the valuable mineral and efficient preparation of bituminous and anthracite coal.

2 PILOT PLANT

for investigation of operating economies and results possible with the Heavy Media Separation process.

3 PRE-CONCENTRATION UNIT

to increase the capacity of other concentration processes without a large capital investment.

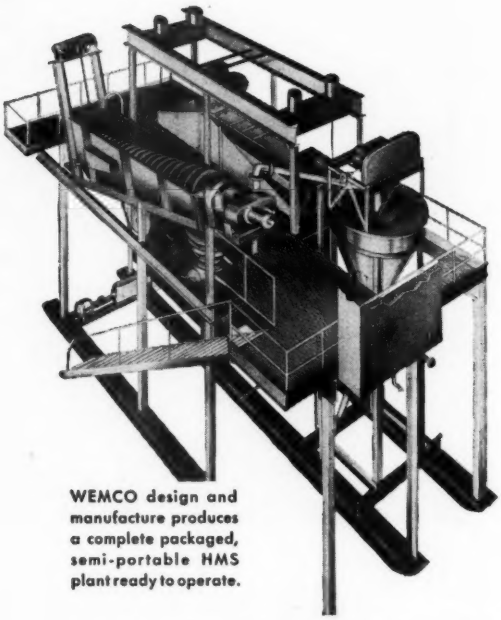
4 TEMPORARY CONCENTRATOR

for profitable recovery of tailings and low grade deposits.

5 MINE DEVELOPMENT UNIT

to raise the grade of development ore to a profitable shipping grade on "a pay-as-you-go" basis.

The Mobil-Mill is installed by merely making the field bolting connections. Entire field erection requires only 36 man days.



WEMCO design and manufacture produces a complete packaged, semi-portable HMS plant ready to operate.

In all these uses, the Mobil-Mill has proved its value in terms of

- **LOW FIRST COST**—as low as $30.00 per ton of materials treated, with the option of a "pay-as-you-go" Rental-Purchase Plan.
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Dangerous Erosion

CONSTANTLY changing methods and equipment are characteristic of mining operations. The application of mechanization in coal, metal and nonmetallic mining has been spurred by the increased cost of labor. Costly cutting, drilling, loading, and conveying equipment is being used in increasing amounts to perform tasks once done by hand.

As we turn to lower grade ores to maintain output, beneficiating plants are built that require vast outlays of capital. Likewise the demand for coal possessing special qualities and in specific sizes is being met by the construction of expensive washing plants utilizing many types and sizes of preparation equipment.

Immense sums of money have been made available to provide the tools and machinery to assure a continuous flow of the basic mineral raw materials essential to nearly all manufacturing and service industries. Still greater sums will be needed in the future to replace worn-out equipment and to purchase new machinery to do the job of mining better. A full return of this capital must be made to those who make it available.

In past years, when tax returns were filed providing for "a reasonable allowance" to replace exhausted fixed assets, a complete return of the capital so invested was confidently expected. After allowable depletion, depreciation, and other deductions, the balance was taxed as profit. No consideration was given to the dollar's declining purchasing power. But who could anticipate that a dollar set aside in 1939 would now only buy 57 percent of the goods and services purchasable with the 1939 dollar?

Now, under an economy dedicated to the dubious principle of cheap money in expanding supply, more of the relatively "smaller" dollars of today are required to replace a wornout facility purchased at a prior date with the "larger" dollars of the past. The net difference between these amounts, if replacement is to be made, must come from the profits that have already been taxed.

Thus we have gradual erosion by taxation of the capital so essential for providing not only for replacements and rehabilitation but for expansion and new processes and facilities. It is most unlikely that the men who devised our monetary system and set up our tax laws had any intent to destroy by degrees the capital that has enabled us to build better and greater means of production and distribution. Presumably their thoughts and actions evolved around the concept of continual progress!

Today the tax conditions that affect depreciable property force industry to draw upon already taxed income to recover investment. A forbidding climate has developed which offers little or no inducement to the taxpayer to make investments in depreciable property. Unless this condition is corrected by tax provisions which allow for replacement at present-day costs, adequate funds to maintain progress may not be made available.

Despite the difficulties involved in establishing a practical method of depreciation involving unstable dollars, a number of companies are tackling the problem. Special reserves, not now deductible for income tax purposes, are being set up to provide for depreciation on current costs rather than original costs of productive facilities.

Failure of the Federal Government to recognize the damaging effect of the increased cost of replacements will permit dangerous erosion and eventual destruction of the capital required to maintain economic and military security.

Object Lesson

EVER since price competition from abroad forced domestic mercury mining to the wall, the industry has been waiting for the foreign cartel to jump its price. On December 21, agents for Mercurio Europeo confirmed reports of a $14 price advance. The price is now $70 per flask fob Spanish or Italian ports or about $92.25 per flask in New York when duty and freight are added.

Following the steady decline in the price of mercury during the first, second, and third quarters of 1948, the sudden rise, although looked for, has even exceeded expectations. Although the recent increase raises the price to the 1937 average level, authorities in domestic mercury mining consider the new price insufficient to justify reopening a shut-down mine at present-day costs.

Five out of the seven principal mercury mines in the U. S. are shut down and the production rate has fallen to 5000 flasks per year. Previous lows were 9600 flasks in 1933 and 6200 flasks a year after World War I when the market was overloaded with war stockpiles. A peak production of about 54,000 flasks per year was reached during World War II.

"The cartel put the price up over-night and they can put it down" was the remark of one U. S. mercury mine official who added—"Unless it gets to $100 and stays there a while, mines aren't likely to open up." Others have placed the reopening figure at $125. In a market completely subject to the manipulations of the cartel, without adequate protection, domestic mines face a rough prospect and a critical situation would arise in an emergency.

The train of events that have nearly killed this small but important segment of the metal-mining industry might be duplicated in other metals. We should use our eyes now for seeing this situation in its true light else we need them later for weeping.

Shaft-Sinking Practice in The Coeur d'Alene

Mechanical Methods Are Applied to Improve Efficiency and Offset Higher Costs

★

By R. W. LOTTRIDGE
General Superintendent
Federal Mining & Smelting Co.

and

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Hecla Mining Co.

★

SHAFT-SINKING practices in the Coeur d'Alene district of Idaho are generally trending towards increased mechanization in order to obtain lower man-hour consumption. This trend has become necessary because skilled mining labor has become less available and because that labor which is available is not only less efficient but more costly.

Pre-Cambrian sediments varying from thin-bedded schists to blocky and massive quartzites make up the country rock of the Coeur d'Alene district. Where feasible the general practice is to orient the long axis of the shaft at right angles to the strike of the formation. Experience, some of it bitter, has shown that deep shafts will withstand substantially greater rock pressure if this practice is followed. Most of the shafts in the Coeur d'Alene district are vertical. However, inclined shafts are used at several properties including the Page and Bunker Hill.

In the drive to reduce shaft-sinking costs attention has been focused upon the mucking phase of the shaft-sinking cycle.

Mucking, as the most arduous of underground tasks, has long made miners unwilling to accept work in the bottom. Rising labor costs and decreased man-shift productivity (which is notable in shaft-mucking) have given the development of mechanical mucking devices a pronounced impetus. Mechanical shaft muckers, exemplified by the Riddell clamshell have not only increased sinking rates and helped lower unit costs, but they have made a substantially larger number of skilled miners willing to undertake shaft work. Anyone who has been faced with assembling a crew of shaft miners can fully appreciate this latter point.

In vertical shafts where the use of the clamshell mucker is not deemed justifiable the pan and skip arrangement is used almost exclusively. This has been generally accepted in the entire mining industry.

The clamshell mucker for vertical shaft-sinking was first used in the Coeur d'Alenes in the Silver Summit shaft. The Riddell shaft mucker consists of a clamshell bucket suspended and controlled from a carriage which is free to move along the long axis of the shaft on a frame hung from shaft timbers. As used in the Silver Summit shaft, it required two operators, one man to operate two Gardner-Denver air hoists which controlled elevating, opening, and closing of the bucket, and one man to operate a reversible Gardner-Denver air motor which controlled movement of the carriage along the frame. At the Summit, the clamshell delivered the muck to 31-cu ft buckets, which it required 1½ to 2 minutes to fill.

Although the mucker achieved remarkably good results in the Silver Summit shaft, it was thought unnecessary to use two men as operators. Hence a double-drum hoist was built to replace the two single-drum hoists, and a foot-operated No-Pak four-way valve was installed to operate the air motor used to propel the carriage on the frame. The single operator can coordinate his actions to gain a high degree of control over the bucket, and with a little practice can place the

Inclined shaft muckers at Bunker Hill operate in balance in hoisting to an auxiliary pocket. The digging bucket rotates to pick up the ½-yd load

bucket at any desired point on the bottom of the shaft. This modified mucker was used a year ago in sinking the Rock Creek shaft, mucking directly into the skip.

New Machine Mucks Inclined Shafts

For mucking inclined shafts, Bunker Hill has developed a machine which will be used in sinking an auxiliary shaft. The practice at Bunker Hill is to first sink an auxiliary shaft, cross cut to the point where the main shaft will intersect the level, and then raise. The machine has been tried out in cleaning several sets of spillage muck from the bottom of the shaft, and gives every indication that its operation will be highly satisfactory. The machine is a self-loading skip and it is anticipated that it will be good for 400-ft lifts. Two machines will be used, one in each hoisting compartment. The shaft is at a 50-deg incline.

The main frame of the machine is mounted on trucks and is attached at the upper end to the hoisting rope. A steel section telescopes inside the main frame; at the lower end of this section the digging bucket is mounted. The bucket pivots on two trunnions during the digging phase. The machine is lowered to the bottom fully extended; the bucket is then in digging position. An air connection is made by a miner at the shaft bottom, to an air motor actuating a screw mechanism designed to retract the telescoping section. As the section retracts, cables, dead-headed at each end to the main frame, cause the bucket to rotate, digging into the muck pile. When the bucket is loaded, the air connection is broken and the machine hoisted. The bucket dumps into a small pocket in the footwall of the shaft, from where it is transferred by slushing to a waste pocket in the main shaft. During dumping of one machine, the other mucker is in the bottom loading itself.

The bucket capacity is approximately ½ cu yd. Changes recently made in the machine include elimination of the teeth on the digging bucket in favor of a Pacific-type digging lip, and the mounting of a bulldozer-type blade on the main frame, just ahead of the wheels. This latter will serve to clean down the footwall of the shaft and to act as a butt-plate for the bucket.

Mounted Drills Supplant Hand-held Machines

Whenever ground conditions permit, drilling is performed almost exclusively by power-feed drifters mounted on a pneumatic bar. This method was introduced first by Bunker Hill, and has since been used in the Atlas, Silver Summit, Star, and Rock Creek shafts. The jackhammer method used prior to inception of the new method has now been virtually abandoned. Its use is confined to shafts where the nature of the ground makes use of power-feed drills impracticable.

Use of an automatically adjusting hydraulic bar permits rapid setups for drilling shaft rounds

Hecla has developed a jumbo that has proved successful in sinking the Star shaft. It was designed to eliminate a portion of the time required in transporting, setting up, and tearing down drilling equipment. The jumbo can be moved up and down the shaft at will. Utilization of two jumbos in separate compartments makes it possible to use as many as six machines in the bottom. The two legs of the column act as air and water manifolds and automatically adjust themselves for length by stingers in their base. In addition to the two mounted machines, a third machine can be mounted on a crossbar. The "tank" in the upper part of the jumbo serves to carry the coiled air and water hoses while the jumbo is not in use. A tugger hoist may be mounted on the jumbo for use in hoisting the mucking pan, steel blasting set (battle ship), and to lift the timber sets into place.

Various Shaft Rounds Used

The type of round used varies considerably over the district, but the bench round is favored in vertical shafts. Its chief advantage in a hand-mucked shaft is that it shortens the mucking cycle considerably. This is an important factor is assembling a shaft crew. With the clamshell mucker it means that no hand-mucking is necessary, as any muck not reached by the clam bucket can be cleared off the bench with an air blow-pipe, giving a clean place to set up and drill. Another advantage of the bench system is that a good sump is afforded, and holes are collared in a section of the shaft that is easily kept dry and clean. The big disadvantage, of course, lies in the fact that only 2½ ft of advance is obtained with a 5-ft round, since only half the bottom is pulled each round. Only half the holes are necessary each round, but time consumed in setting up, tearing down, and in clearing smoke is doubled.

In the Star shaft, where sinking will resume this winter, a 9-ft round will be tried out, in conjunction with use of the Riddell mucker. A burn-cut round will be drilled in the geometrical center of the bottom from a special jumbo, designed to insure that all holes in the burn are parallel.

Detachable bits are used in the district almost exclusively, but tungsten carbide bits are being tried out in recently initiated sinking programs.

Powder used in the district varies considerably, both as to type and strength. Electric primers are used exclusively.

The Cameron-type No. 3 or No. 5 sump pump has now been generally replaced by air-operated centrifugal pumps. These are light in weight and easy to move around. The IR35 is the most popular pump used for this purpose, and weighs 75 lb. It will deliver 150 gpm at a head of 100 ft. It pumps to a tank, moved periodically down the shaft, from where an electric pump pumps through the shaft water column to the main sump. Fire hose has in some instances replaced the use of bull hose for shaft pumping; it is light and flexible, therefore easy to handle; connections are made quickly and simply.

Elimination of the tank may be pending—if a trial proves successful, Bunker Hill will pump directly from the sponge pump to a motor pump which will be installed in the main column, with booster pumps installed as necessary. The sponge pump will be operated in the usual manner and the other pumps will be automatically controlled by pressure switches in the line.

Shaft-sinking practice in the past several years has alternated between the three-shift system, where each oncoming crew takes up where the preceding crew left off, and the two-shift system, where each phase in the drilling-mucking-timbering cycle was performed by the same men each time. Bunker Hill has previously used the latter system, but will swing over to sinking on three shifts a day. It seems evident that over-all costs are lower for 24-hour sinking, even though man-hour consumption per foot should be lower for specialized two-shift sinking.

It is standard operating procedure for all the companies in the Coeur d'Alenes to use a contract or bonus system in paying crews for shaft work.

The best shaft-sinking record in the district, although it did not record the fastest advance, is probably that of the Atlas, sunk 800 ft in 1941. DA35 drifters on an air bar were used and mucking was by hand into a pan. The three-compartment shaft was put down at a direct labor expenditure of 20.7 man hours per foot. Bunker Hill sank its three-compartment shaft at about the same period, for a comparable expenditure.

The record for daily and monthly advance in the Coeur d'Alene District is held by the Silver Summit, where a three-compartment shaft was put down at an average rate of 5.147 ft per day and 155.4 ft per month. In one month Silver Summit advanced 204.5 ft.

Despite improved methods costs are higher than those encountered in prewar days. The only criteria by which progress in shaft-sinking methods can be measured, then, is in man-hours consumed per unit of advance. This too is questionable, as there is little doubt that a shaft crew today will do less real work than the same crew did eight or ten years ago. Notwithstanding this decrease in labor efficiency, man-hour consumption per foot of advance today is lower than ever before. This, then, will indicate the soundness of the trend to mechanize and simplify operations to a maximum degree.

In describing the experiences of shaft sinking at the Page and Galena, no attempt is made to cover them in detail. Certain points peculiar to these shafts or the particular sinking job will be brought out.

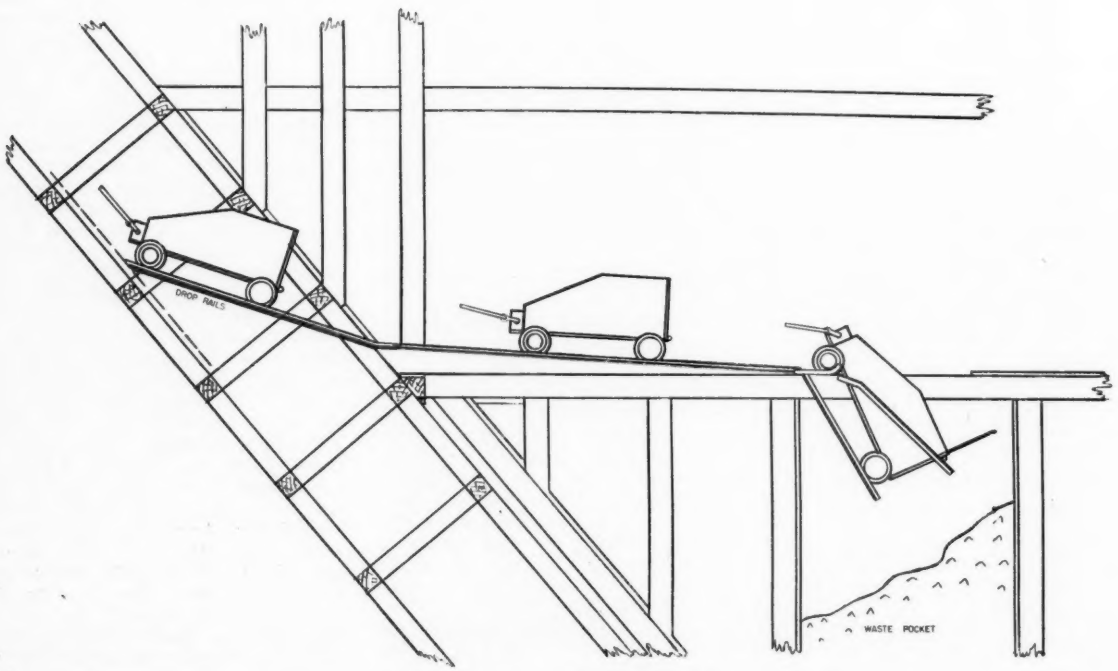
Both shaft-sinking jobs are typical examples of where, due to local conditions, some of the more modern mechanization methods become of secondary importance in accomplishing the objective.

Page Shaft Is Inclined

The Page Mine is located about four miles west of Kellogg. It has a three-compartment, 50 deg inclined shaft measuring 5 ft between wall plates. The hoisting compartments are 4 ft 10 in. between breast plates and the pipe compartment 4 ft 4 in. In 1947-48 the Page shaft was sunk 385 ft below the 2400 level.

Hand mucking was used. A small skip with the back cut down, having a capacity of about 27 cu ft, was used in which to muck. A small sinking hoist was located on the bottom level station. In sinking prior to this time, a crosscut was run around under the shaft on the bottom level from which a raise to the shaft formed a small pocket. The waste was trammed from this pocket to the main skip pocket. This system had the disadvantages of requiring a man for waste transfer and of having a sheave wheel in one hoisting compartment above the station thereby preventing one of the main skips from coming to that level.

These disadvantages were overcome by mounting the sinker hoist opposite the pipe compartment, reeving the cable through a system of sheaves so that in the hoisting compartment it emerged below the level of the top of the shaft running rails. The skip was converted to a bottom dump type by putting a vertical sliding door on the end. Horns were welded on the sides of the door for opening it. It operates as follows:



Bottom-dump, sinking skip in the Page shaft discharges automatically

(1) The skip is spotted above the level.
(2) Drop rails are lowered to the shaft rails from the station.
(3) The skip is lowered on them out onto the station. The rails on the station being inclined, the skip rolls to a position over the front end of the main waste pocket.
(4) Here the rails curve down into the pocket. The skip starts down into it but the horns on the door catch on brackets alongside the rails. The door is raised and the skip dumps its load.
(5) The door closes by gravity when the skip comes out of the dump.

The main skip can come to this level but, in the interest of safety, only does so on special order.

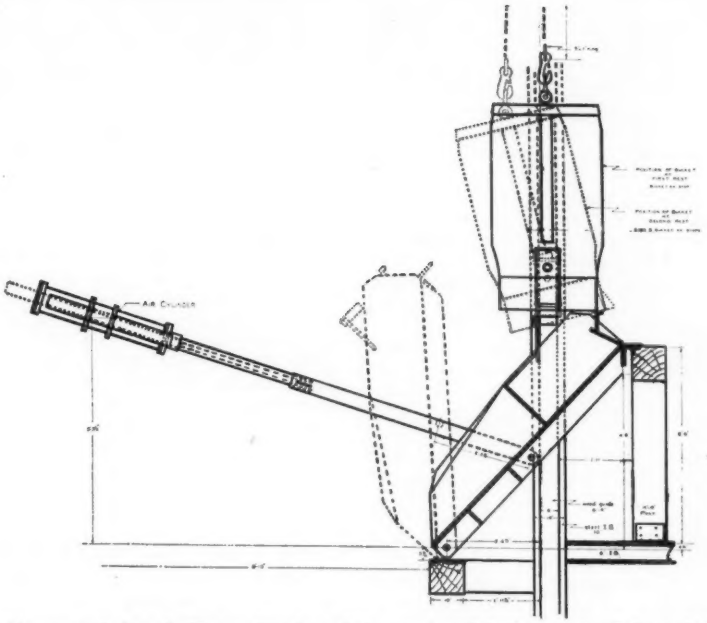
The normal crew for sinking is 12 shaft men (four on a shift, one of whom is a pusher) and three sinker hoistmen.

The Page shaft roughly parallels a vein structure and below the 2400 level, this crossed from the footwall to the hanging wall of the shaft. In this zone, the quartzite was brecciated, would not stand well, and had a tendency to run out from behind blocking. The sides of the shaft were laced tight—stringers or sheeting caps were placed on top of the regular shaft sets and cribbed cedar bulkheading was built up on these to catch the back which, of course, ran up above normal height.

At one point the hanging wall became so heavy that it was unnecessary to use sets with vertical posts instead of normally inclined shaft sets to support the ground. As the work progressed, sets were shortened from 5-ft centers to 2½-ft centers and were carried against the bottom. Spiling was driven tight against the hanging wall from each set to prevent any slough or run from taking place. From here on, greater caution than ever was exercised. Just the bottom half of each short round was drilled and blasted, the upper half being picked, or, where necessary, plugged, to get in timber. The station was cut and pocket raised without any difficulty, although it was necessary to spile the station approach.

One of the disadvantages of handling bad ground in an inclined shaft is that the components of force are such that any loose material will run down over the end of the sets in somewhat the same manner that it would if the shaft were vertical—instead of choking itself off as it would on a properly lagged drift set.

An inclined shaft does, however, have many operating advantages, particularly for handling material and equipment. The material handling skips, which are hung underneath the ore skips by means of cables with safety hooks, are run out on the stations and disconnected. Their loads are then removed by means of small, hand-operated cranes equipped with electric hoists, and transferred directly to the cars or trucks on the level tracks. Even four-ton battery locomotives and other large pieces of equipment are handled in this way.



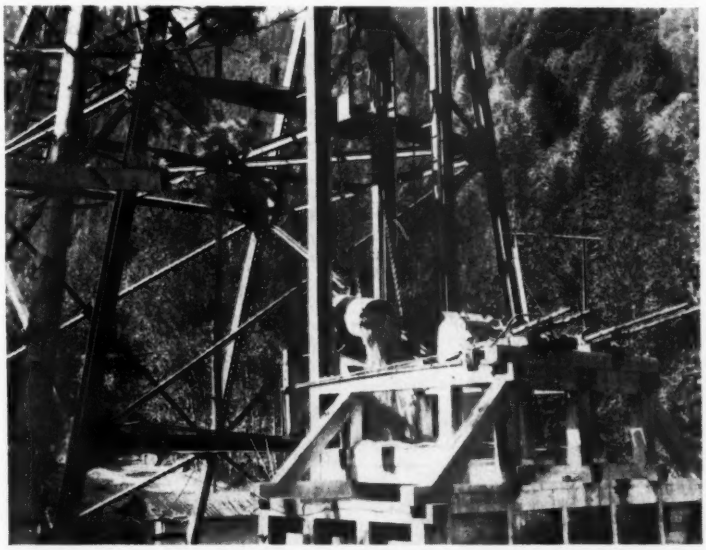
Air-operated door facilitates dumping of shoe-equipped bucket at the Galena shaft

Indicative of the difficulty in obtaining experienced and competent shaft men, only one-third of the men hired for the bottom had ever worked in a shaft before and 40 percent had had less than two years' experience underground.

Galena Shaft Will Go to Sea Level

The Galena shaft sinking operation is being watched with considerable interest in the Coeur d'Alenes, as it is the most easterly exploration at depth in what is locally known as the Dry Belt. The next most recent exploration at depth is the Silver Summit, lying about 2.7 miles to the west.

The work at the Galena is being



The Galena shoe-equipped sinking bucket dumps when lowered in the guides to strike bracket on door

carried on by the American Smelting and Refining Co. with the Day Mines, Inc., participating in the program. The operation is managed by the Federal Mining and Smelting Co.

The Galena shaft is located about three miles by road west of Wallace, Idaho, and was the operating shaft of the Galena Mine of the Callahan Zinc-Lead Corp. until operations were shut down in 1928. The objective is to sink to 3000 ft, or approximately sea level, for exploration purposes. The original was a two-compartment shaft for 357 ft enlarged to three compartments for the last 481 ft.

It was decided to make it a four-compartment rectangular shaft. This was done, after dewatering, by raising up next to the west end. The timber for the new compartments was spliced to the old timber by the following method: The end plate tenons on the old timber were chiseled out for 3 in. of their width and this part removed. The new wall plate section had a tenon 3 in. long and near the top as in an end plate, instead of near the bottom as in a wall plate. This tenon was slipped in to fill the space that had been occupied by the portion of the end plate removed by chiseling.

The two center compartments are the hoisting compartments, the east is the pipe and manway and the west is lined smooth with shiplap to form a duct for ventilating air. This latter is carried above the collar for about 20 ft to provide a natural updraft. In the winter time when the temperature differential between outside and shaft bottom is considerable, the air moves with such a velocity that it is necessary to partially close the passage to prevent it from getting too cold. Blasting smoke clears in about 30 minutes. During warm weather a fan pulls through the compartment, smoke time being about the same.

The regular crew consists of 24 men as follows: a superintendent, 2 shift bosses, 12 shaft men (4 on a shift, one of whom is a pusher), 3 topmen, 3 hoistmen, 1 timberframer, 1 mechanic and 1 surface laborer.

The country rock thus far has been what is known as the Wallace formation and is a steeply-dipping, thin-bedded sericitic schist. The shaft had been started with its long axis parallel to the strike of the bedding, which is not desirable.

The Riddell type of shaft mucker was used until the condition of the ground would no longer permit leaving dividers out and it became necessary to timber to the bottom.

In addition to improvements heretofore described, guide shoes were installed on the mucker carriage. This was done so that if anything went wrong with the machine it could be hoisted to the surface without delay for repair, and also so that it could be hoisted clear of blasts.

Timber was framed in the conventional manner: wall plates from 12 by 12 in. and posts and dividers from 10 by 12 in. Size of compartments below 838 is 58 in. between wall plates and 48 in. between dividers, leaving 40-in. cage clearance between the 4 by 6 in. guides. The wall plates were in one piece until it was necessary to timber to the bottom and then, since they were too long to land, they were spliced in the center. The middle divider was framed as an end plate and the splice ends of the wall plate each had a tenon half as long as the divider tenon was wide. This gave a rigid joint.

The hoisting equipment consists of the 300-hp, double-drum, electric hoist, winding one inch ropes at a full speed of 800 fpm. To the ends of the ropes are attached small single deck cages complete with safety dogs. Underneath the cages and suspended by 27-ft chains were 31-cu ft buckets.

Guide Shoes Used on Buckets

A unique feature of the buckets is that they are provided with a guide shoe on each side near the bottom. These guide shoes are mounted on trunnions with the trunnion above the center of gravity of the shoe so that the shoe tends to hang in the running position when it is off the guide in the bottom. It was the duty of the man operating the mucking machine to see that the shoes engaged the guides as it was brought up from the bottom. To assist the shoes in engaging the guides, the guides were tapered at the bottom.

The reason for putting guide shoes on the buckets was to prevent them from catching timber while being hoisted or lowered.

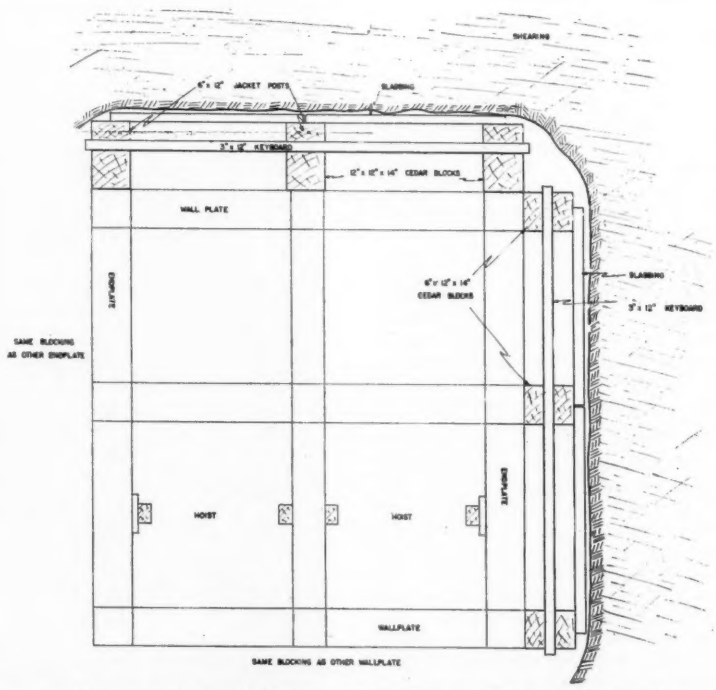
The bucket dump at that time was the chain-ball, notch-in-door type. The placing of guide shoes on the buckets necessitated a change in the dump which operates as follows:

(1) The bucket is hoisted above the door.
(2) The door, which is hinged on the bin and is operated by an air cylinder, swings out across the shaft.
(3) The bucket is lowered, the bottom edge away from the bin strikes a bracket, overturning it toward the bin.
(4) The shoes then come to rest on another bracket and the bucket hinges over, dumping its load.

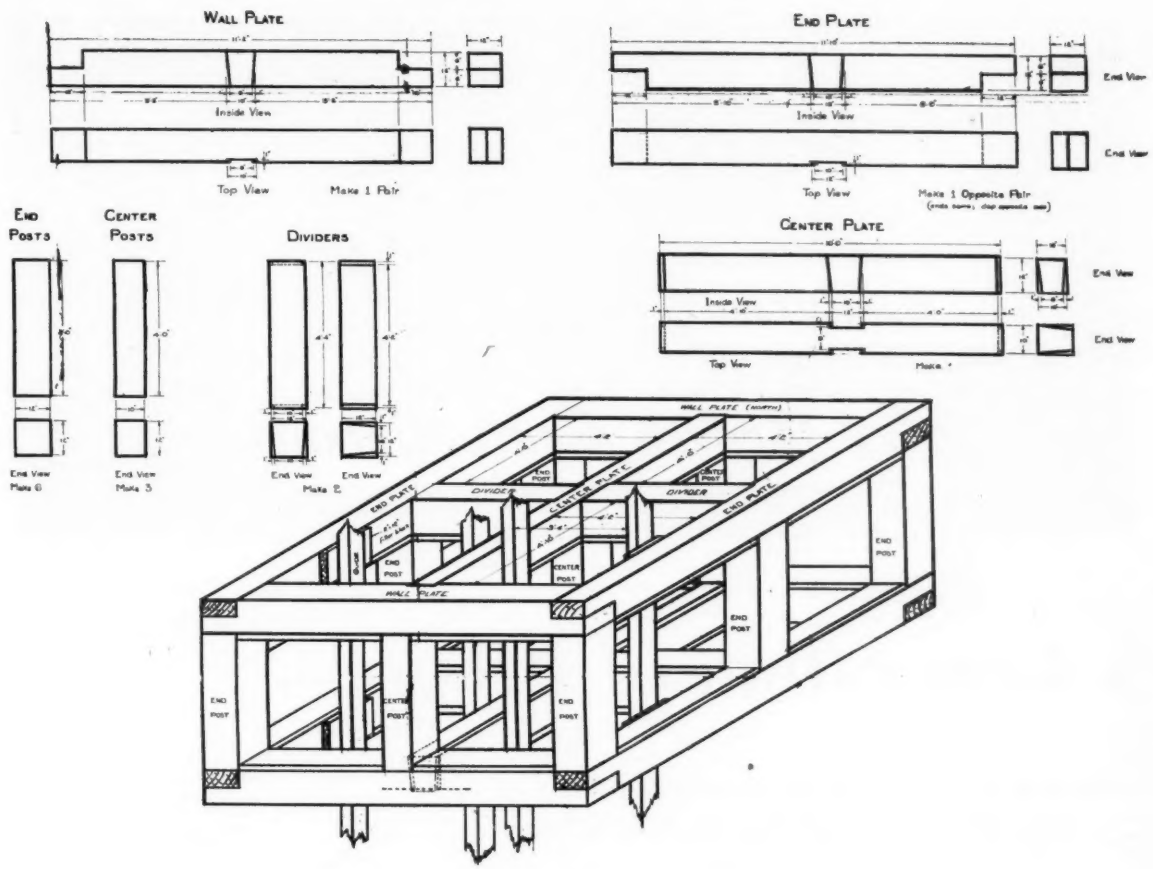
Although this type of dump was evolved because of the necessity for putting shoes on the bucket, nevertheless it is the smoothest operating bucket dump we have seen.

Changing from Rectangular to Square Section

Most of the trouble in the bottom was due to the exposure along the strike of the bedding. Both the sloughing and squeezing were coming principally from the sides of the shaft. A solution was to change the



A jacket set with special blocking was required to change the Galena shaft from rectangular to square section



Square section set used in the Galena shaft has center plate in addition to dividers

section of the shaft from four in line to a square section, leaving the two hoisting compartments where they were and placing the ventilation compartment in back of one and the pipe compartment in back of the other.

This change in section, by cutting in half the length of exposure along the bedding, would cut the slough in more than half because the slough took the shape of an arc from corner to corner. Also the length of timber exposed to pressure from the sides was cut in half. The square would offer a more stable section over all. After due deliberation this plan was adopted along with the idea of a semi-jacket set.

The transition from long section to square section was made in two sets. The ground was taken out for about the full length of the long shaft far enough into the north wall to accommodate the new sets.

A collar set was laid on the bench thus formed, with the bearing timbers extending into the ends. A square set was built on this and from the outside top of this, timbers were angled back to catch the second shaft set up.

In framing the new square section timber what would be the center divider is now called the center plate. From the center of it to the center of the end plates are two dividers. The blocking behind these sets numbered from timber to wall is:

(1) Cedar blocks, 12 in. thick.
(2) Key boards.
(3) Five foot long vertical stringers.
(4) Blocking, if required.
(5) Heading and lacing.

Cedar blocks are used for the reason that although they will support the timber, they are compressible, compared with other timber, and will take up squeeze. When they have taken up all the squeeze they can, they may be replaced without having to perform a major repair job on the timber itself. As a precaution against end squeeze pinching the guides, a 2 by 12-in. cedar filler block is placed between the end plates and the outside guide.

Aside from timbering and mucking, the operation is carried on much as it was before. Timber is kept close to the bottom and the dividers are left out of the last set to facilitate mucking. The round consists of 40 to 44 holes and pulls much better than in the rectangular section, because now the cuts are drilled across the bedding. Since starting the new type of timber, the shaft has advanced approximately 300 ft without difficulty.

The ground still takes its quick initial squeeze and it is necessary to change some of the blocking and relieve the pressure. However, the timber has moved little, the shaft is in good alignment, and it is thought that repairs can be made without cessation of sinking. The changes in practice that have been made appear to have been justified.

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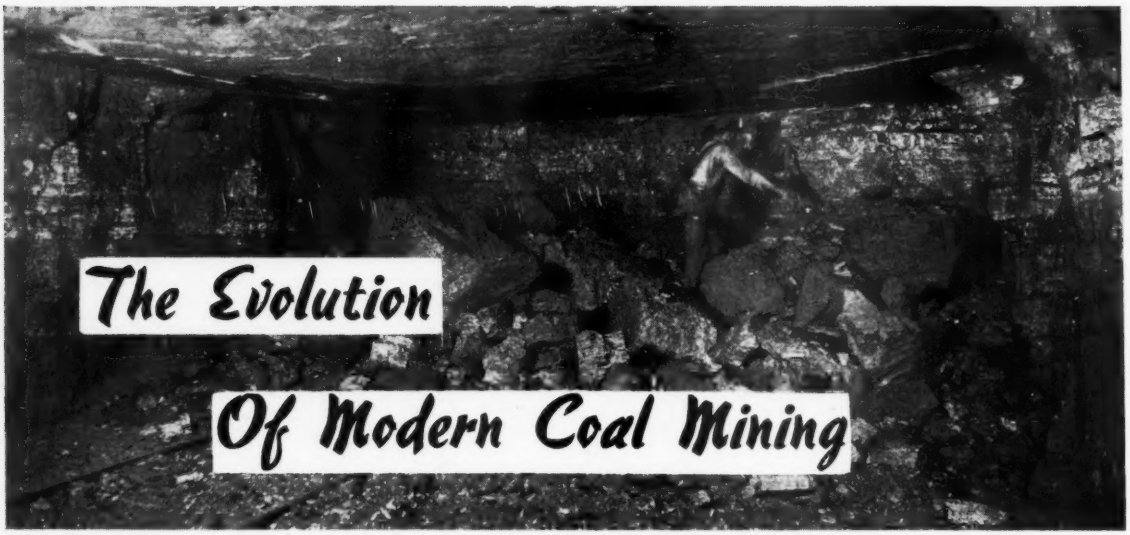


A Generation of Progress

Records Over the Past 25 Years Show the Course Followed in Mechanizing the Coal Industry

By GLENN B. SOUTHWARD
Mechanization Engineer
American Mining Congress

DURING the past generation the coal mining industry has made a record which few other industries can match—a complete change from hand to mechanical methods. Starting from scratch about 1920, mechanical loaders, conveyors, and strip pit shovels began a development which has steadily progressed, until today these types of equipment are producing more than 70 percent of the total bituminous tonnage. This progress was not a natural evolution, it was a forced growth brought about by hard work and by overcoming difficulties. New operating methods had to be learned; personnel problems arose from the discarding of traditional mining practices; new equipment that could be economically operated and maintained, had to be designed and built, and finally new hazards called for new safety technique.

Records of Modernization

The accompanying tables tell an interesting story of how mechanization has developed in the United States as a whole and in the major bituminous coal fields. The figures in themselves are readily understandable, but the purpose of this article is not primarily to discuss statistics; the intent is to supplement the figures by showing how the progress was made, and as far as possible to explain why the developments followed along certain lines. This is with the thought that some mistakes that occurred in the past might be prevented from recurring in the era of expanding mechanization which we are now entering.

The over-all record given in Table I divides the total bituminous tonnage into four general classifications—mechanical mining, conveyor mining, stripping and hand loading. In this classification, mechanical loading includes the tonnage by mobile machines, scrapers and duckbills; conveyor mining includes tonnage that is hand shoveled onto face conveyors and in pit car loaders. The earliest

Myers-Whaley shovel, developed before 1920, was the first successful coal loader

available records for these tonnages are for the year 1923, but no attempt was made to distinguish between mechanical loading and conveyor mining until 1928, when the production was separated into the two major classifications.

The growth of mechanized loading has been remarkably steady, although this is not so apparent in the tonnage figures, due to the over-all drop in production during the years of the depression and the stimulus to production during the war years. However the percentage figures do clearly show the steady rate of increase of mechanical mining, including stripping, and the corresponding decline in the production by hand mining.

Table II shows the progress of loaders and conveyors in the four major fields—that produce the bulk of the bituminous tonnage of the United States—(1) Appalachian—which includes Pennsylvania, Ohio, West Virginia, Virginia, and Kentucky; (2) Illinois-Indiana; (3) Alabama; and (4) the Rocky Mountain states of Colorado, Utah, Wyoming, and Montana. Illinois and Indiana led the mechanized production until 1938 when the Appalachian Field went into first place. This is on the basis of the number of tons loaded; in percentage, Illinois-Indiana have always led, and preliminary estimates indicate that in these two states, only 5 percent of the total tonnage is now mined with hand loading. The Rocky Mountain field is a close second with almost 90 per cent of its tonnage produced with mechanized loading. In the eastern group approximately one-third of the tonnage is loaded by hand. The individual state record seems to be held by Wyoming, where the mechanized loading and stripping tonnage approaches 100 per cent of the production.

The change from hand to mechanical coal-mining methods has been a gradual evolution with each progressive step taken slowly and in logical sequence. The three articles presented here tell the story of this continuing change—first, an over-all review of 25 years of progress—then Coal Division Committee reports on present operating methods with standard types of equipment, and finally, a look into the future possibilities that are offered through continuous mining.

There were practical reasons why these fields developed as they did. In the early days of experimentation, southern Illinois offered an ideal proving ground for mobile mechanical loading. Here the coal was of good height, fairly free from impurities, nearly level, and with good top and bottom. Furthermore, these conditions existed over a wide area and

TABLE I

BITUMINOUS PRODUCTION MINED WITH VARIOUS TYPES OF LOADING

Expressed in Thousands of Tons

	TONNAGE MINED					PERCENT OF TOTAL TONNAGE			
	Mech. Loading	Conveyor Mining	Stripping	Hand Loading	Total Tonnage	Mech. Loading	Conveyor Mining	Strip Mining	Hand Loading
1923		1,880	11,884	550,801	564,565		0.3	2.0	97.7
1924		3,496	13,607	466,584	483,687		0.8	2.8	96.4
1925		6,148	16,871	496,933	519,952		1.2	3.2	95.6
1926		10,022	19,923	543,321	573,266		1.8	3.4	94.8
1928	14,559	7,000	19,879	459,307	500,745	3.1	1.4	3.9	91.6
1929	19,271	18,571	20,268	476,878	534,988	3.8	3.6	3.8	88.8
1930	23,338	23,644	19,842	400,702	467,586	5.2	5.3	4.2	85.3
1931	22,689	24,873	18,932	315,595	382,089	5.9	6.5	5.0	82.6
1932	17,587	18,230	19,641	254,252	309,710	5.7	6.0	6.3	82.0
1933	20,511	17,309	18,270	277,541	333,631	6.1	5.2	5.5	83.2
1934	23,836	17,597	20,789	297,146	359,368	6.6	5.0	5.8	82.6
1935	28,388	18,789	23,647	301,549	372,373	7.6	5.1	6.3	81.0
1936	45,483	21,494	28,125	343,986	439,088	10.3	4.9	6.4	78.4
1937		83,500	31,751	330,280	445,531		18.8	7.0	74.2
1938	63,103	21,990	30,406	233,046	348,545	18.1	6.3	8.7	66.9
1939	84,208	26,504	37,773	246,400	394,885	21.3	6.7	9.6	62.4
1940	112,579	35,291	43,167	269,674	460,711	24.4	7.6	9.4	58.6
1941	142,686	43,981	55,072	272,410	514,149	27.8	8.5	10.7	53.0
1942	182,389	50,514	67,202	282,588	582,693	31.3	8.7	11.5	48.5
1943	203,274	46,531	79,685	260,687	590,177	34.5	7.9	13.5	44.1
1944	227,380	46,809	100,895	244,492	619,576	36.6	7.6	16.2	39.6
1945	221,426	41,086	109,897	205,210	577,619	38.3	7.1	19.0	35.6
1946	207,570	37,771	112,964	175,617	533,922	39.0	7.0	21.0	33.0
1947	252,611	45,546	139,395	193,072	630,624	40.1	7.2	22.1	30.6

TABLE II

BITUMINOUS TONNAGES MINED WITH MECHANICAL LOADERS AND CONVEYORS IN THE MAJOR FIELDS

Expressed in thousands of tons

	Appalachian		Illinois-Indiana		Alabama		Rocky Mountain	
	Mech. Loading	Conveyor Mining	Mech. Loading	Conveyor Mining	Mech. Loading	Conveyor Mining	Mech. Loading	Conveyor Mining
1928	4,727	1,538	5,402	3,995	95	519	3,543	384
1929	5,241	3,487	8,545	12,981	107	827	4,122	508
1930	5,622	5,495	11,718	14,631	271	1,785	4,216	626
1931	5,937	7,521	12,090	13,998	220	2,018	4,200	464
1932	2,450	7,228	10,111	8,473	157	1,080	3,140	788
1933	1,841	6,796	13,497	7,847	176	1,213	3,278	779
1934	3,213	6,221	15,844	8,042	142	929	4,399	921
1935	4,072	5,944	17,796	8,484	286	1,017	5,669	1,249
1936	12,036	9,198	25,010	8,246	541	1,200	7,146	1,423
1938	26,496	13,242	26,132	3,137	798	1,219	6,298	1,632
1939	42,353	18,766	30,906	2,052	1,041	1,867	7,774	1,443
1940	64,151	25,565	35,332	1,595	1,603	3,402	9,188	1,609
1941	87,316	32,695	40,243	1,291	2,007	3,841	10,487	2,000
1942	111,883	37,165	48,561	1,308	3,641	5,147	14,234	2,010
1943	121,560	35,218	56,668	1,146	4,050	4,278	18,989	1,537
1944	137,539	34,599	62,466	900	5,013	4,991	19,858	1,686
1945	135,109	30,818	58,952	622	5,270	4,054	19,343	1,552
1946	133,396	30,021	50,374	503	5,255	2,885	15,694	920
1947	170,018	17,260	54,306	343	7,282	3,307	17,656	814

A forerunner of the Goodman Duckbill

applied to a number of mining companies, thus giving an excellent opportunity for an interchange of ideas and cooperation in the development of mining methods. With this setup, coupled with a sincere desire to mechanize, Illinois rapidly forged ahead in the adoption of mechanical loading.

In the Appalachian field, there was no such uniformity in seam heights or other mining conditions; moreover, in the high coals there was not the incentive to mechanize as the costs and performances with hand mining were considered satisfactory. Consequently mechanical loading made rather slow progress in the eastern states. However, the situation was different in the thin seams where conveyors soon demonstrated their ability to mine low coal at a less cost than could be achieved by hand shoveling into mine cars. This condition also prevailed to some degree in Alabama where conveyors were first applied to longwall mining. In Wyoming, particularly in the Rock Springs area, there were pitching seams too steep for economical operation with track equipment. The shaker conveyor, which was originally designed for down-grade transportation, proved successful with hand shoveling, and had the further advantage of working under extremely bad top, where its narrow width, as compared to track and mine cars, permitted close timbering. However, it was obvious that something more was needed. In answer to this need, the duckbill loader was developed and became the forerunner of present models.

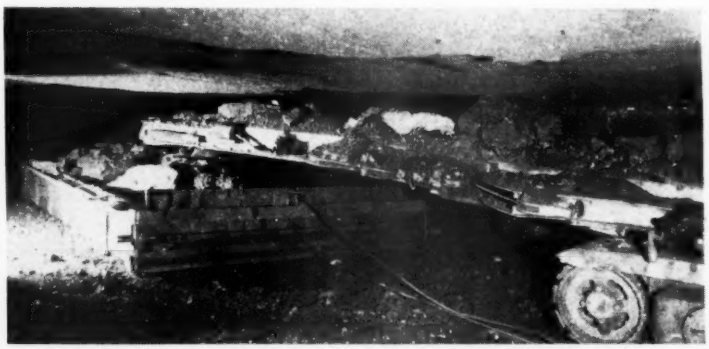
Problems Encountered in Mechanizing

There are no authentic records available as to when mechanized loading was first introduced in coal mining, but by 1923, trial operations were being carried on in many fields. These, however, were regarded as strictly experimental and it was not until 1928 that the coal industry became definitely mechanization conscious. By that time, numerous successful operations had demonstrated that mobile loaders and face conveyors were destined to play a leading part in the future production of coal.

With the acceptance of this idea, the next step was to see how the machines could be employed to the best advantage. This brought its problems. The mining practices for every underground operation then in use were the results of years of hand working, and the entire technique of those days was built around a loading unit — which was a man — with a capacity of say ten tons per shift. A mechanical loader with a potential capacity of 50 times this tonnage obviously could not be directly substituted in the mining systems and operating practices then in use. It was not long until actual operations brought home the realization that everything which was then considered good practice underground was due to become obsolete. However, with this realization came the knowledge that quite a long time, years in fact, would be needed to make the necessary changes and that it would be best to proceed gradually.

Developing Mining Systems and Operating Practices

The mining plans came in for first attention. The standard room and pillar system involves tramming the equipment from one working place to another, with consequent lost productive time. In addition, there are the delays in changing cars behind the loading boom of the machine. Similar delays occur in conveyor mining where the time for extending the conveyor after each cut, and the



The Joy loader in low coal tries a drag box for service haulers

A Jeffrey belt conveyor for gathering haulage was installed in 1930

time for moving all equipment to a new location when a room is finished, add up to a considerable portion of the working shift. Long face mining seemed to offer a solution to these difficulties, both for loading machines and conveyors, and its possibilities were so attractive that a vast amount of energy was spent in trying to devise some method of modified long wall.

Virtually all of these attempts failed due to unfavorable roof action. What was not realized at the beginning, but was learned the hard way, is that the essential factor for successful longwall mining is adequate roof support, by packs, cribs, or heavy steel jacks, and the cost of providing such support is prohibitive in the coal mines of the United States. These early failures are not necessarily conclusive, and some form of a continuous mining plan remains as a definite future possibility.

Since it appeared that the room and pillar system must be retained, for a while at least, immediate efforts were directed toward overcoming its two inherent disadvantages for mechanical operation. To decrease the number of moves necessary for a shift production, an increased tonnage from a working place was gained in two ways—by widening the rooms, and by increasing the depth of the cut. Then, to further reduce the amount of travel necessary for all equipment in an operating unit, the practice of taking more than one cut in a working face during the shift was developed. This concentrated the operations into a relatively small area. The increased rate of mining had a favorable effect on the roof, which in turn enabled many mines to go to a true retreating system and to make a higher recovery from the room pillars. All these developments served to increase the production of a loading unit.

Improvements in Service Haulage

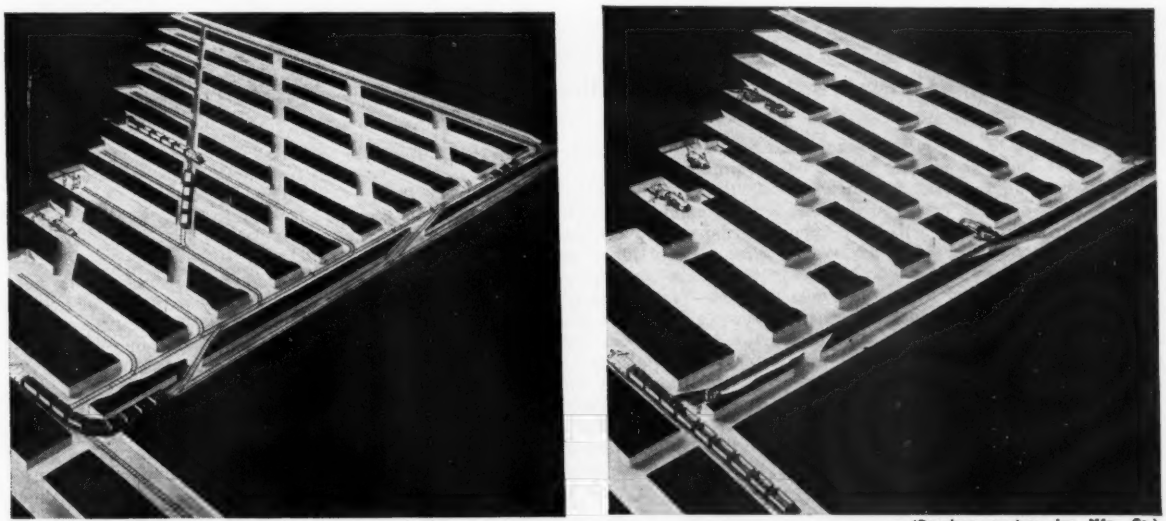
Next in order came a number of attempts to reduce the time for the car change behind the machine. In past days, most cars were of small capacity, less than three tons being the rule, and a large number of car placements were required for even a moderate tonnage. Consequently, the total amount of time spent by a machine during a shift in waiting for a load to be replaced by an empty was quite appreciable. Many methods were tried to correct this waste—double track in the rooms with two gathering locomotives to a loader; and wide rooms with the track across the face where a trip of cars could be placed for loading. Such methods were limited in their application to seams with exceptionally strong top.

In one mine, a track-mounted hopper with a conveyor elevator was used experimentally as a surge bin between the loading machine boom and the mine car; the idea being that the machine would load into the hopper while the mine car was being changed. This did not fulfill its promise; when there was a delay in the car movement, the hopper became full and then offered no advantage. Another company had a double track room arrangement—one for empties and one for loads—with a movable crane which lifted a mine car from the empty track and swung it across to the loading track behind the machine. This proved too cumbersome to be practical. None of these trials found the answer and the final result which came to be accepted as best practice is to have a single track in a room, with switches into breakthroughs where loads and empties may be shifted. These switches are so located that the maximum travel distance for the service locomotive is in the neighborhood of 100 ft, thus cutting the time for the car change to a minimum.

In considering the foregoing, it must be remembered that in former days the only means of underground transportation for mobile loading machines was with mine cars and track. Hand mining equipment served the purpose for a while, but the demand for greater efficiency and a further reduction in the mine car delays led to the design of larger mine cars—in some cases as much as ten tons capacity. These, together with improved track construction, answered for track-mounted equipment. About the same time, shuttle cars came into use and solved the service haulage problem for the tractor loaders. Then the development of gathering belts, together with the introduction of rubber-tired cutting machines and drills, gave the industry two distinct choices for mechanized operation—track and trackless mining.

Coal Preparation

From the very beginning, one of the most serious difficulties which mechanical loading faced was to mine a product which maintained previous standards of quality. The earlier successful mechanical operations were naturally in seams which had only a few impurities and where the partings that did exist were of such nature that they could be removed by hand, either at the face or at the tipple. Following hand mining tradition, the first attempts were made at the face—by the loading machine men, by the car trimmers, or in some cases by a special crew which preceded the loading



(Drawings courtesy Joy Mfg. Co.)

Modern panel designs for track and trackless mechanical mining

and picked slate from the coal after the face had been shot down.

It soon became evident that these methods were either restricting the tonnage of the loading machine, or were using too much labor underground. Surface picking tables served for a while to supplement the underground cleaning, but this method was confining mechanization to within fairly narrow limits. So something more had to be done and the answer came through mechanical cleaning. It is not necessary to recount all of the steps that were followed until the several separation processes were perfected; many difficulties had to be overcome, but these were met and have resulted in the modern technique of today—full-seam mining underground with the coal and slate separation made mechanically at the surface.

The Evolution of Loading Equipment

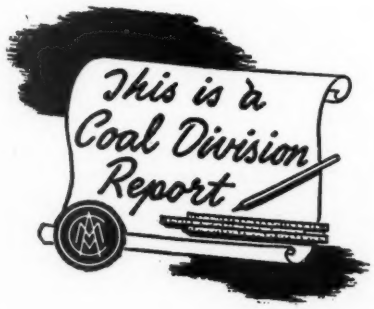
The acceptance of mechanization in the late 1920's was followed by a flood of inventions for loaders and conveyors of all types, and there is no way of knowing, or even estimating, how much time and money was spent in designing, building, and attempting to operate all of the new designs. As a matter of record, the 1929 Year Book of the American Mining Congress carried illustrations and descriptions of 56 pieces of various types of mechanized loading equipment, which were then being manufactured for sale. This list included: 14 mechanical loaders, 23 conveyors, 13 pit car loaders, and 6 scrapers. In addition to the 56 devices illustrated, there were many others that had at least one working model in the mines, to say nothing of the numerous ideas that had reached the drawing board and small-scale model stage.

As a warning to present day inventors, less than a half-dozen of these machines have survived in their original form, and scarcely another half-dozen have direct descendants now in use.

Remaining from the experiments of the 1920's are the track and tractor loaders, the duckbill, the shortwaloader, and chain and shaker conveyors. The pit car loader had what might be termed a "sky rocket course," but nevertheless served a useful purpose as a first step from the hand miner to the mobile loading machine, preparing the way for group working which is a necessary part of mechanical operation. Always regarded as a temporary expedient, the pit car loader reached its height in 1930; then its production steadily declined until it is about zero today. Scrapers to a lesser degree had a somewhat similar history. During experiments on long face mining, where a quick removal of equipment is a decided advantage in times of roof trouble, scrapers seemed to offer some promise. In room and pillar work, however, their intermittent loading operation ultimately diverted most of their use in the bituminous fields away from coal to rock loading in mines where top or bottom are brushed.

It must not be assumed that all these efforts were wasted; there were no precedents for mechanization to go by and the only way to determine the worth of a machine, or an operating practice, was to try it out. From the numerous trials, experiments, and false starts, knowledge was gained, both on what to do and what not to do, which has led to the development of today's successful machines and operating techniques.

Coordinating and Combining Face Operations



A Study Covering Operations from the Face to the Room Neck, Showing Methods Used to Increase the Productive Time of a Mechanical Unit

By the Committee on Mechanical Mining

RISING costs for labor and material in coal mining must be met by increased operating efficiency and higher productive performances. In mechanical mining, with any type of equipment, the problem of reducing costs is not so much a matter of increasing capacities of the various machines, as it is to increase their productive time. This has been the objective since the first loading machines were put in the mines. Although it is not yet within reach, continued improvements in all the face operations have brought the goal nearer. Several methods of approach are used and the aim of the committee is to present to the industry accounts of systems that have had some degree of success under different seam conditions.

Recognizing that the operations in a mechanical mining panel are all interdependent, the committee felt that their study must necessarily include the three productive phases of the panel—face preparation, loading, and service haulage—as integral parts of the one subject. Because of the numerous variations that exist in present mining plans and operating practices, the committee further felt that their report must be largely confined to describing more or less typical operations and the accounts published in the following pages were prepared with this object in view. Three types of mining are described—(1) where each of the face operations is performed separately with tractor loader, tire-mounted drill, and shuttle cars as in the conventional type of mobile mechanical loading, (2) where the loading and service haulage is performed as one operation by the duckbill, and (3) where the cutting and loading is done simultaneously by the shortwaloader. Continuous mining, where all operations are performed by one machine, is to be covered by a future committee study.

Mechanical Loading with Shuttle Cars

Describing Two Methods of Operation—Selective Mining and Full-Seam Mining, Where Each Face Operation is Performed Separately and with Separate Machines

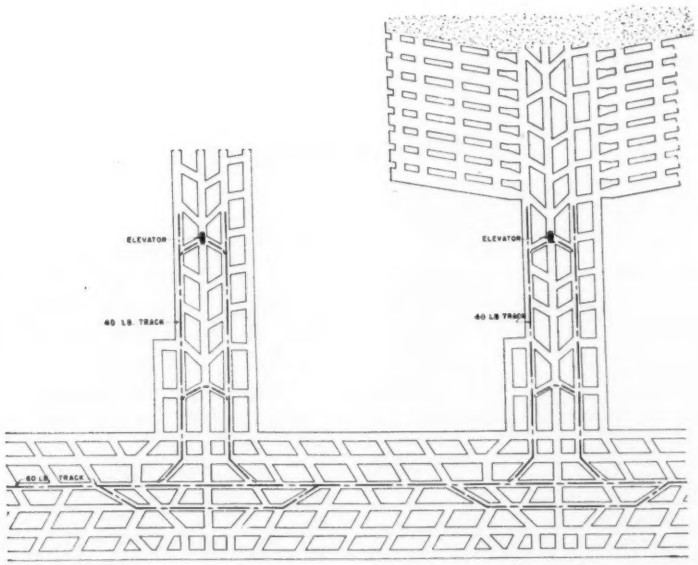
By WILLIAM E. EDMUNDS

THIS report describes an operation using tractor mounted loaders, three-ton storage-battery shuttles for the service haulage, and track with ten-ton steel mine cars for the intermediate and main line. The cutting machines are tractor mounted arcwalls, with 9-ft bars; the drills are the electric, tire-mounted, mobile type and the shooting is with permissible explosive. The seam has a total height of 70 in., consisting of 18 in. of coal, 10 in. of boney and 42 in. of coal. Under the seam are 6 in. of binder and dirty coal which are not mined.

The room and pillar system is used but the pillars are not extracted. Flat headings are driven in series of six on 50-ft centers with breakthroughs 14 ft wide on 90-ft centers at a 60 deg angle, left or right, from No. 4 heading which is the shuttle car runway during the entry development. The extreme left and right hand headings are 18 ft wide with the remaining headings 14 ft wide. Track with 60 lb rail is in No. 3 heading which is the mine-car haulageway.

Present Operation with Selective Mining

The panel headings are in sets of four, driven at right angles from both sides of the flat headings at intervals of 760 ft. Rooms are turned at 80 deg left and right from the extreme left and right entries respectively, and are necked while the headings are developing. All panels are worked full retreat with no pillar extraction. Rooms are driven 25 ft wide on 40-ft centers for a distance of 325 ft with breakthroughs every 80 ft. Eight rooms worked on cycle constitute a mechanical loading production unit. Track with 40 lb rail is laid in two headings which are on 100-ft centers and is looped through a connecting breakthrough in a 50-ft radius semicircle every 320 ft for a loading point from the shuttles to the mine cars. This permits continuous trip loading without interference from haulage motors. (See Fig. 1.)



Plan for selective mining

This method is designed to separate the slate from the coal by loading each product separately. Coal faces are double cut in the boney making a 12-in. kerf and removing all of the parting; a full arcwall cut averages 8 ft in depth and 25 ft in width. The top and bottom cuts in the boney are followed with back bitting and a sweeping cut to remove excess cuttings; the machine is not moved on the bottom from the time it starts until the cutting is finished. The average time for cutting a room and tramming is 40 minutes; headings 14 ft wide require sumping and tailing out thus taking about the same time for cutting as wide places.

After the cut is completed and previous to drilling, the machine loads the cuttings into three-ton shuttle cars which haul the material to the entry where it is loaded into mine cars. This operation, including tramming, requires an average of 15 minutes in 14-ft places and 21 minutes in 25-ft rooms. After the cuttings are loaded out, the face is drilled for blasting. Three holes are used in the top coal and three in the bottom coal in 14-ft places; 25-ft places require five holes in the top and six in the bottom. Regular 5-ft and 9-ft twist-type augers with tungsten-carbide bits are used in making holes 2 in. in diameter. The average drilling time, including tramming to the next place, is 25 minutes in a 14-ft place and 40 minutes in a 25-ft place. With a tire-mounted, electric drill, one man performs this operation and also cleans kerf in narrow places.

The shooting is accomplished by a certified shotfirer using permissible explosives with machine-pressed clay dummies for stemming. All the holes are charged and tamped before the first shot is fired. These charges are fired singly, with permissible blasting batteries. Firing order of holes is from rib to rib, either left to right, or right to left. A fall of coal in a 14-ft place yields about 20 tons and in a 25-ft place yields 35 tons. The average shooting time, including tamping and moving, is 25 minutes in 14-ft places and 41 minutes in 25-ft places.

After the coal is shot down, the loading crew and equipment reenters the working place and loads out. The coal is handled similar to the cuttings as far as loading and transporting to the mine cars is concerned, but, of course, is segregated from the refuse. The average loading time, including tramming, varies from 25 minutes in a 14-ft place to 41 minutes in a 25-ft place.

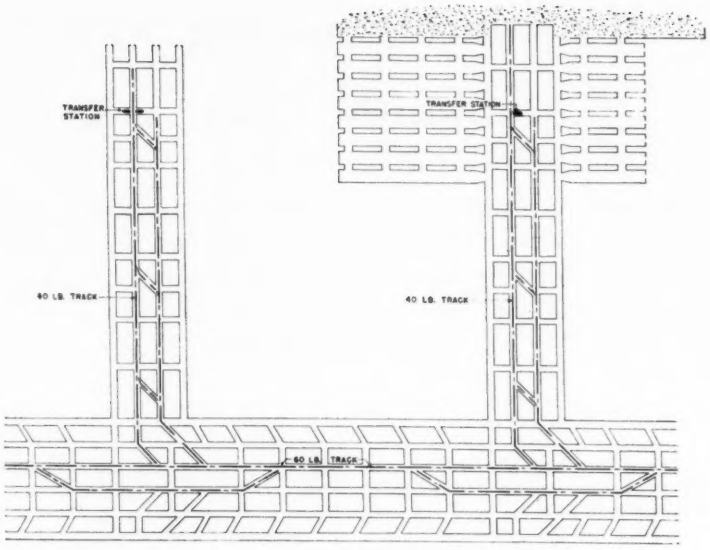
Proposed Full-Seam Mining

In the near future a cleaning plant now under construction will be put into operation which will be capable of segregating the refuse from the coal, thus eliminating our present expensive underground selective mining system.

The coal will be loaded by a high capacity, crawler mounted, loading machine into six-ton, cable-reel shuttle cars dumping directly into ten-ton steel mine cars. Loading points will be established every 320 ft and the maximum shuttle car haul, one way, will be 500 ft on development and production. (See Fig. 2.) The average loading time will be 40 minutes in 26-ft places and 28 minutes in 14-ft places.

Cutting will be by shortwall machines with bugdusters and cutting bars capable of making 8½-ft cuts. This machine will be transported on a crawler-mounted truck. Eight rooms will complete a cycle on room production, and four entries, plus room necks, right and left, will complete a cycle in panel entry development. The machine will make the cuts on the bottom just above the 2 in. of binder, giving clean coal cuttings. This operation, including moving, will require an average time of 37 minutes in 26-ft rooms and 30 minutes in 14-ft entries.

The same type of mounted drills and augers, as previously described, will be used in the drilling operation. Eight 9-ft holes will be required in 26-ft places, six near the top with two breaker holes beneath the boney. Five 9-ft holes will complete the face drilling in a 14-ft place, four near the top with one breaker shot beneath the boney. The average time for this operation in 26-ft places will be 31 minutes and in 14-ft places will be 24 minutes.



Plan for full-seam mining

The shooting will be performed similar to the previous description, with the exception that the breaker holes will be fired first and the shotfirer will work from the middle toward the ribs on either side. A 14-ft place will yield 30 tons of material per fall and a 26-ft place will yield 50 tons per fall. The average time for shooting, including moving, will be 40 minutes in 26-ft places and 25 minutes in 14-ft places.

Full seam mining will give a better productive performance than the present method of selective mining. There will of course be a greater burden on the cleaning plant as the 12 in. bone parting, which is now handled from the face to the slate dumps as a separate product, will pass through the preparation plant, increasing the percentage of rejects to about 23 percent of the total tonnage handled. However, the productive time of the loading unit underground will be materially improved. In a room, selective mining requires two operations of the mechanical loader; 21 minutes to load out the cuttings, and 41 minutes to load the coal—a total of 61 minutes. Full-seam mining will require only 40 minutes for one loading operation.

Mechanical Mining With A Combination of Two Operations

Describing Typical Face Cycles with the Duckbill Loader and the Shortwaloader

By G. W. STUMP

IN mechanical loading, either with track or tractor-mounted, mobile machines, the conventional plan is to have each face operation performed separately and with separate equipment as described in the previous report; the cutting, drilling, blasting and loading follow in sequence as parts of the unit cycle. As a means to shorten the cycle, some mines combine two or more operations by one machine or by one crew; for example, in some cases the cutting and the drilling, or in others the drilling and the blasting, is done by one crew of two men. In the equipment field, two types of machines that combine two operations have been in successful operation since the early days of mechanization—the duckbill loads and gathers, and the shortwaloader which cuts and loads. Neither type is mobile; both remain at a face working on a continuous cycle and take two or more cuts during a shift. Typical operations with each of these machines are described in the following reports.

The Duckbill Loader

A mechanical loading head for a shaker conveyor combines in one machine the two functions of loading the material and conveying it from the face to the gathering haulage at the room neck. The coal is cut, drilled, and shot down in the conventional manner.

For the purpose of this discussion,

The "dead pan line" solves the supply delivery problem

we will assume a typical duckbill operation in a room 40 ft wide, manned by a crew of three men. The cutting machine is a shortwall with an automatic bugduster which eliminates kerf cleaning and the hazard of suspensible dust; drilling is either with a hand-held or post-mounted, electrical drill. To secure maximum results, an overlapping cycle of face operation is employed; this, of course, is modified for varying mining conditions, but in general, its sequence would be as follows:

After the coal is prepared and shot, the loading starts at the right rib and works from right to left to permit resumption of cutting and drilling operations at the earliest possible moment. When a portion of the face is loaded, the shortwall moves from its parked position at the left rib into its right hand sump position. As soon as the crossover of the cutting machine is completed, the loading is resumed and the shortwall continues its operation with its bugduster piling the cuttings in a windrow parallel to the face. Meanwhile, the drilling is going on and as soon as the cutting is finished, the duckbill is returned to a center position ready for its move up. During the move up operation, the shortwall operator has been preparing to shoot the face, and with the shooting completed, the men and machines are ready to repeat the cycle. Delivery of supplies at the face, always a problem, is accomplished by a false pan line in parallel with the operating pan line.

Although the face cycle described is effective in certain mines, particular conditions in other mines might necessitate variations. However, a well-planned cycle that provides for simultaneous performance of as many face operations as possible is essential for the highest efficiency. Frequent observations by periodic time studies will often reveal many irregularities, which when corrected by small adjustments, will promote increased production. The following is a recap of such a time study, taken on an operation in a 34-in. seam of coal, in a room 43 ft wide with an average cut of 7 ft. A crew of three men in a seven-hour shift, load out a total of 143 ft of lineal face, producing 120 tons of coal.

Operation	Man minutes	Percent
Loading	268	19.7
Cutting	385	28.6
Drilling	112	8.2
Dusting	58	4.3
Tamp and Shoot	108	8.0
Pan Change	186	13.7
Delay	95	7.0
Idle	59	4.3
Timber and Headers	85	6.2
	1356	100.0

The Shortwaloader

This machine combines cutting and loading into one operation. It stays in one working place, and is moved across the face by ropes and jacks in the same manner as a shortwall. The face is drilled and coal shot down with explosives according with usual practice. The cutting and loading element consists of a chain cutting bar approximately 10 ft long with two loading bars each approximately 5 ft long, mounted vertically above. In operation these short bars work in loose coal that has been shot down while the end 5 ft of the longer bar is undercutting the solid coal face. All three rake the coal into the gathering conveyor on the end of the machine where it is carried to a room conveyor for haulage to the room neck. The cycle of operation is as follows:

Sump: The machine is pulled straight ahead into the loose coal until the loading bars are against the solid face (about 5 ft). The loose coal ahead of the loading and cutting bars is raked back by them into the gathering conveyor, clearing the way for the machine as it moves into the face.

Cut and Load: The machine moves across the place from right to left, the cutting and loading bars raking the shot coal into the gathering conveyor, and at the same time the end of the cutting bar that extends beyond the loading bars makes a 5-ft cut in the solid coal. The speed at which the machine progresses is dependent upon conditions, such as hard cutting, maximum capacity of the gathering conveyors, load on the machine, roof, etc. Cutting and loading proceeds until the left rib is reached. Under normal conditions 35 ft is the most efficient room width.

Drill: Drilling is done while the machine progresses across the face; the right rib hole is started as soon as the machine has cleared sufficiently to permit the driller to work. Drilling time should not be used in computing cycle time since it is an overlapping operation.

Charging and Blasting: Charging and tamping the holes and extending the pan line are overlapping operations and should be completed in

Cutting and loading in one operation

about the same time. The shot firing is done after the conveyor is extended and the shortwaloader is repositioned. This completes a full cycle of work for one cut as rock dusting, timbering, advancing canvas and supplies, and the other work coincident with mining has been done while the principal phases of the cycle were being carried out.

The crew in a 35-ft place consists of four men: the operator, helper, driller, and the preparation man, who timbers, rock dusts, gets supplies, advances canvas, extends pan line, etc. All members of the crew are expected to help one another with the general work in the place.

Operations	Time spent Minutes	Percentage of working time
Moving	14	15.3
Loading	36	37.2
Extend Conveyor	5	5.3
Tamp and Shoot	24	25.6
Timbering	3	3.1
Handling Supplies	1	1.1
Delays	10	12.4
	93	100

A time study summary, which is an average of three studies taken simultaneously on three shortwaloaders, is given below. The machines were working a 49-in. seam of coal, operating in rooms 34 ft wide. Each machine had a crew of four face men who worked an average of 6 hours and 41 minutes at the face, making 4.3 cuts and producing an average of 121 tons. Drill time is considered as a delay, for in a correct cycle it should be done during the loading and moving and should not appear as a separate operation. Moving time is the time spent in moving the machine to its first loading position and completing the cycle. The results of this study, while applying to the specific conditions described, can nevertheless be used as a basis for estimating performances under other conditions.

Continuous Mining

Coordination of Auxiliary Operations Essential to Full Production

By GERALD VON STROH
Director, Mining Development Committee
Bituminous Coal Research, Inc.

FOR generations the continuous mining machine has been the dream of the coal mining industry. Some of the first patents on continuous mining machines were issued as early as 1870 and since that time almost 300 patents on this subject have been issued. Many of these ideas were reduced to practice and tried out—some were in a limited way successful.

In the early years a source of power was a serious problem. A 100 hp electric motor of 1900 could hardly be taken into even a "high" coal mine. Despite power difficulties, a continuous mining machine was built and used as early as 1870. This machine was used for experimental tunnel boring as a prelude to a projected tunnel under the English Channel. This project was abandoned for political reasons, but not until both England and France had driven six miles of experimental tunnels. These machines were powered with compressed air supplied by large, stationary, steam-powered compressors on the surface. Considering the stage of mechanical evolution in 1870, this was no small achievement.

McKinlay adopted this same "boring principle," present in his first patents issued near the turn of the century. The first commercial McKinlay entry driver was put into service around 1920. Four of these machines are still being used and on the basis of their cutting and loading, are giving astounding performances today. About this same time the Jeffrey Mfg. Co. put its entry driver on the market. This machine used a combination of cutting and impact and was reasonably successful.

Then there occurred a period of better than 20 years of almost complete inactivity on continuous mining between the McKinlay and Jeffrey period and the recent revival which started about four or five years ago. World War II accounts for a few of the years but not all.

There appears to be two principal reasons for this lapse. They were economic and evolutionary, and both were related. The great depression started in the coal industry about five years prior to the general depression, or in the middle twenties. At this time, the continuous mining machines were still rather unwieldly, single-purpose machines, expensive as compared to the conventional mining machinery of the period. Mining machinery sales were falling off. The mines were reducing their output and there appeared to be no funds available for experimentation and exploitation. Although basically wrong, developments suffer when business is bad. This economic condition continued until as late as 1938.

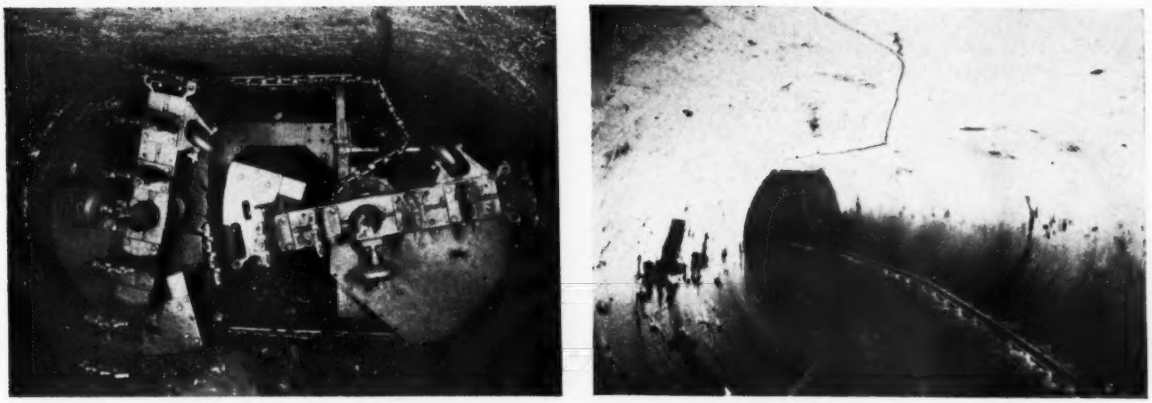
Meanwhile, equipment of a more generally useful nature, such as loading machines, shaker conveyors, etc., were slowly being evolved. A good part of their improvement was conceived and tried out by individual mines and when successful, adopted generally by the machinery builders. This pattern to a large degree still exists. Such a pattern is sound, though slow, evolution.

Service Haulage—A Key Problem

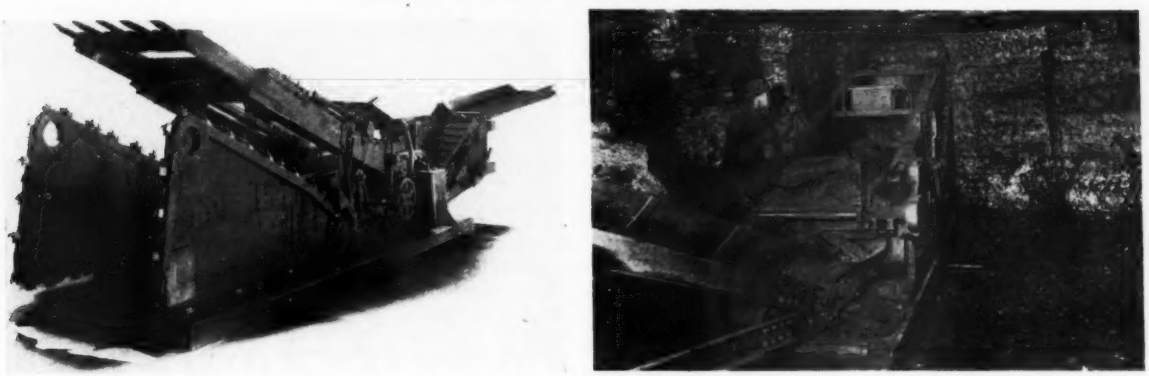
Another possible reason for virtually abandoning continuous mining machines even though in principle they were successful, are the basic inadequacies in the other elements of mining. These inadequacies still exist and still confront the industry and must be eliminated if the industry is to use a continuous mining machine in a continuous manner and do any better than was achieved in the early twenties. Some of these elements are: face conveying; timbering; safety, including ventilation; and dust control.

Methods of handling these elements must be radically improved or a continuous mining machine will be just as much out of step today as it was 20 years ago. To illustrate: a 1920 continuous mining machine was recently observed cutting and loading from the solid without the use of explosives at a rate greater than five tons per minute. This machine was capable of removing 300 tons per hour or 1800 tons per shift from the seam, yet its production average was 200 tons per shift. Certainly the lack of flexible mobility accounted for some of this reduction, but that can be easily corrected. The greatest limiting factor to the production of this machine was the inability to get the coal away from the machine as fast as it could be mined. There is today

Extracted from a paper presented at the West Virginia Coal Mining Institute, Morgantown, W. Va.



Early types of continuous mining machines. The two views above show the McKinlay and a sample of its work; below is the Jeffrey entrydriver and its operation



no method of face conveying that will permit continuous production of anything like five tons per minute in high or low coal.

Another continuous mining machine has a theoretical capacity of 420 tons per six-hour shift. Its actual production average was 180 tons per shift in 7-ft coal. In this instance, the use of large shuttle cars solved the transportation problem. What will happen when this machine is used in low coal where it must travel farther to reach 180 tons per shift and must use small shuttle cars?

Roof Control

In one mine where one of the latest continuous mining machines is in use, the average delay for timbering, using the best of timbering equipment, is almost 15 per cent. Again this is high coal, and this particular machine has a relatively slow rate of advance.

Returning to the 1920 machine, when it is cutting and loading five tons per minute, it is advancing at the rate of 12 in. to 18 in. per minute. In West Virginia, in a mine where only legal timbering is required, it was calculated that with the best of equipment it would require an average of two minutes per foot of advance for timbering. This 1920 machine can advance twice to three times as fast as can be timbered.

Every effort and attempt to evolve a continuous mining machine should be aided and encouraged but we should not lose sight of the fact that a high-speed system of roof control or of face conveying will be just as substantial and necessary a contribution.

The Importance of Auxiliary Operations

These problems are with us today with our present systems of mining. How much more will they be aggravated by a continuous mining machine?

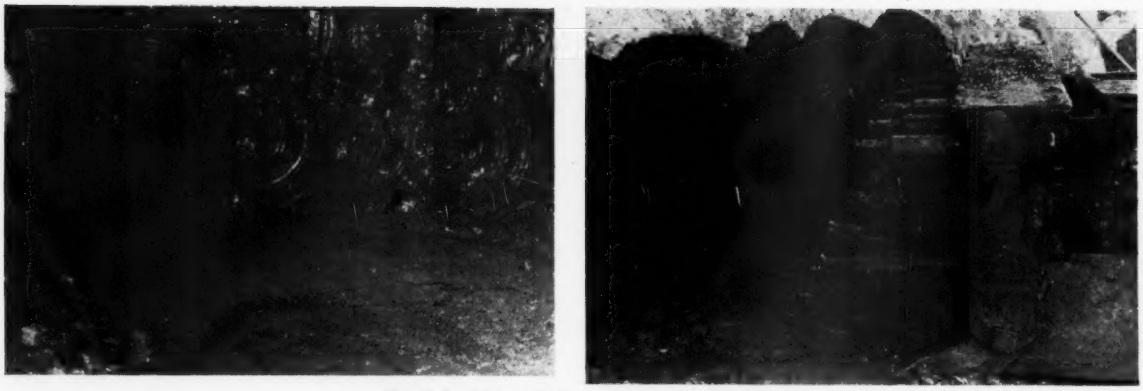
It would appear that the goal should be continuous mining in which a continuous mining machine is but one of six major elements. These six major elements of continuous mining are: (1) Removing the coal from the seam, (2) Conveying the coal from the face to main line haulage, (3) Roof control, (4) Safety, including ventilation and dust control, (5) Conservation of investments, (6) Main line haulage.

These six elements must be viewed with the thought that we must achieve an uninterrupted flow of coal from the seam to the tipple. That is continuous mining.

One machine observed operating in high coal gave less than half its potential. One of the principal reasons for this, inherent to the principle and arrangement of the machine, was the need for taking the cutting element away from the coal and repositioning at frequent intervals. When this machine is used in low coal this factor will become increasingly important. A machine principle must be found that will not interrupt the flow of coal at the face. Conveying and timbering methods must be evolved that will eliminate interruptions of coal flow.

In regards to ventilation and dust control, it is to be expected that a continuous mining machine will create more dust per minute than conventional mining, if only because more tons per minute will be handled. By the same token, in gaseous mines it is to be expected that more gas per minute will be released. Both of these items, it would appear, can create conditions which will interrupt the flow of coal.

Many of these elements are realistic problems with today's systems of mining. Attention to them is partially diffused by the additional problems of cutting, drilling, and shooting, but they do exist and although some progress is being made, evolution is slow.



The Colmol has a battery of ten rotary cutters

Cooperative Studies and Experiments

Can we accelerate this evolution? The Mining Development Program of Bituminous Coal Research is a step in the right direction. This program is new, its formal activity having started on September 1, 1948. This is an experimental program not only in regards to the projects it considers, but as a mechanism for accelerating the evolution of the mining industry.

At present this committee is attempting to study and review the operating conditions of the subscribers and to classify the conditions under which continuous mining must work. It is also reviewing, in so far as is possible, all prior and existing attempts at evolving a continuous mining machine. Although not a part of this program, equipment builders have been most cooperative and have revealed some of their most confidential developments in order to be of service to this program and assure its success.

The committee intends to attempt to evolve a yardstick for continuous mining against which it can measure ideas, principles, and attempts to fill the needs of continuous mining. Also intended is the development of a machine principle that will fit the mine conditions of subscribers.

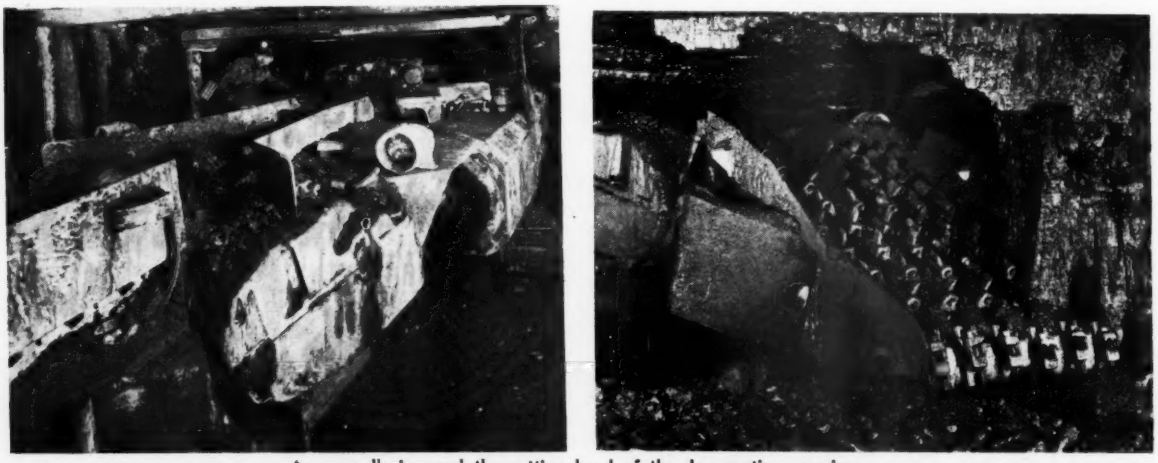
Although continuous mining may ultimately mean a whole new philosophy and system of mining, immediate efforts should fit into the framework of existing mining practice and systems. Proper emphasis will be placed on all elements of continuous mining instead of one. In the ultimate evolution of this program subscribers can be served by helping them evaluate their own ideas, suggesting they be discarded if they do not "measure up" and aiding completion if they do appear to fit into continuous mining. The Mining Development Committee wants to review and correlate experiments and help make them successful and of benefit to all.

Development Engineering Essential

This is a vital element required to accelerate the evolution of continuous mining. This branch of engineering, not to be confused with industrial, mining, or efficiency engineering, is generally accredited with making possible at a much earlier date such things as automotive production lines, continuous stripmills, continuous oil refining, etc. It is used by virtually every major industry but to all practical purposes is ignored by the coal mining industry.

Development engineering is, in effect, making available creative mechanical engineering know-how, plus sound industry economics on a basis isolated from the day-to-day emergencies of production. How many plans, programs, and ideas—basically sound—have been started and dropped because of lack of final design know-how or because some major project or mine emergency interfered until the idea was cold?

Most major industries have recognized the value of ideas and the need for their conservation and through exploitation, industry has evolved development engineering as a mechanism to fill this need. It is hoped that ultimately both coal mining companies and coal land companies will adopt this mechanism on a local basis. If the Mining Development Program is successful, it will prove the value of such engineering and set the pattern for its utilization.



An over-all view and the cutting head of the Joy continuous miner

Morenci has 230,000,000 tons of ore containing 30 lb of copper per ton or 450,000,000 tons containing somewhat less than 20 lb per ton

National Mineral Resource Appraisal

A Complex Problem That Will Become More Acute—Better Information Needed Now

By S. G. LASKY

Chief, Mineral Resources Section
U. S. Geological Survey

THE expanding demand for metals and minerals in the United States has brought with it a variety of serious and perplexing problems that require, for their solution, comprehensive information about the nation's mineral resources. Attempts to assemble and use the information available, however, have demonstrated that our present knowledge is far short of our needs.

The problems range from stockpiling and military procurement to tax revision and industrial financing. They stem from several sources: Our known deposits of raw material were seriously depleted during the war; our population is increasing at an unexpectedly rapid rate, coincident with an increase in the per-capita demand for metals and minerals; and, finally, the instability of world affairs is forcing the United States into unprecedented plans and actions.

If these critical matters are to be handled satisfactorily, everyone concerned—producer, fabricator, consumer, and many agencies of Government—must have the best possible information. In general, industry must have mineral-resource information that will enable it to plan sound and profitable operation over the years. Government needs information that will enable it to establish sound policy and take sound action in the many fields of national welfare in which our mineral wealth must be taken into account. There is no conflict here: The national interest is simply more inclusive in its responsibilities and so requires more comprehensive basic data; if the national requirement is satisfied, the needs of industry will be cared for in the process.

This compelling need for better information about our mineral resources makes it pertinent to inquire first, what such information should consist of and, second, how to go about getting it. This paper attempts to discuss some aspects of the first subject.

Reserves and Resources

Before entering such a discussion, however, it is well to distinguish between reserves and resources. In common technical usage, the term ore (or mineral) reserve always has a qualified meaning, and estimates of reserves include the conditions to which they apply and the assumptions upon which they are based. Thus, there are commercial reserves and submarginal reserves; there are proved, probable, and possible reserves; there are measured, indicated, and inferred reserves; reserves at a cut-off of x percent of metal, or y percent, or z percent, or of x, y, or z dollars per ton.

This aspect of the concept of reserves permits a useful distinction between reserves and resources, because if we confine "reserves" to material

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minable under the conditions specified we then discover a distinct and useful application for the word "resources," as representing the sum total of all categories of reserves. In particular, we would have a place in the family of reserves for those deposits that otherwise seem to be waifs, i.e., undiscovered deposits and those containing so little metal as to lie beyond present-day consideration.

In this paper, then, the two terms are used according to the following definitions:

Ore (*mineral*) *reserves* include those mineral deposits that are known to exist—or for the existence of which there is at least some evidence—and that have aspects of usability within a practical limit of time and within a specified set of economic and technologic conditions.

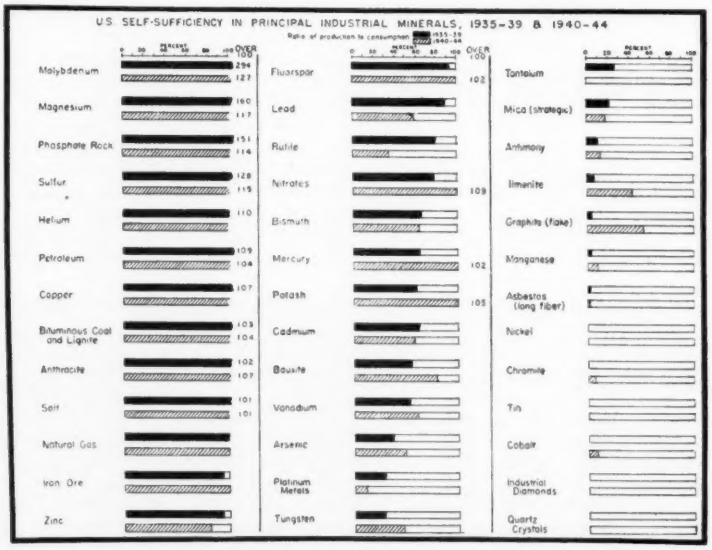
Mineral resources include all the material in the ground, discovered or undiscovered, usable at present or not, rich or lean, considered within the context of all factors, quantitative and qualitative, that may influence its conversion into a "reserve," and within the context of all factors that enter into prediction or opinion as to possible future usability.

Data Required

Any attempt at a comprehensive study of mineral resources must start, perforce, with an inventory of the material in the ground. This does not mean an inventory in the sense that a merchant counts the articles on his shelves, in the warehouse, and on order, for it is obviously impossible to count all deposits that may exist. It does mean a quantitative estimate of the undiscovered ore, as well as the usual estimate of the material for whose presence there is some evidence (reserves). This can be obtained only by means of shrewd geologic study and analysis. And not only must the inventory include the usual estimate of the material having the grade and character permitting its use under the prevailing conditions, but it must list also any material of lower grade and less favorable properties that may become usable and minable within the practicable future.

This estimate of the material in the ground should be supported by an analysis of the geologic factors (such as faults and water) that will control mine operation; by an analysis of the physical, chemical, and mineralogic features of the ore that will affect its metallurgical treatment and recovery; and by a classification of the material in the ground as to its possible usability. The comprehensive appraisal would contain also an analysis of the material in the ground in the light of numerous operating and economic factors, ranging from mining methods to the availability of foreign sources of supply.

Knowledge of our mineral assets is essential information that is closely linked to the future of these United States. Actually, what constitutes a mineral resource will change with mining and metallurgical developments, price and market conditions, profit incentives, and competition from abroad. Some of the problems involved in evaluating our mineral resources are outlined here by a geologist of long experience.



Charts such as this can be misleading unless accompanied by an inquiry into many factors, besides reserves, that influence production

Interpretation of Data

This wide variety of data must be analyzed, interpreted, and presented in a way to yield results that are undistorted, unambiguous, and, above all, relevant to the problem at hand. In industry, reserves are sometimes expressed in terms of the number of years they will support a specific mining operation at the chosen rate of production and under assumed economic conditions. For a national appraisal, it is pertinent to express them in terms of how long they can support the metal and mineral industry of the nation as a whole. The questions commonly asked about our mineral resources—and those underlying all others on the subject—are: How much do we have? How close does it come to filling our needs? For how long will it do so? In other words, what is the degree and duration of our mineral self-sufficiency?

Considerations of consumption, production and capacity to produce are inherent in these questions. There is usually a wide disparity between the three. At any particular time, the greatest production that can be achieved is limited by the productive capacity of the industry regardless of reserves or of demand; the actual production achieved represents the industry's response to the net economic situation of the time. The range of production rate and the speed with which maximum production can be achieved represent what may be called productive flexibility. As the war demonstrated, the degree of flexibility varies highly from one segment of the mineral industry to another.

Presentation of Data

A logical way of studying and summarizing reserves is to present them in terms of both production and consumption, and perhaps in terms of productive capacity. Moreover, a comparison of reserves with production and consumption seems to be the only way of stating the situation quantitatively—a reserve is large or small, adequate or inadequate, not in terms of absolute amounts but in terms of a comparison between what can be produced and what is required.

In addition, production and consumption constitute the best quantitative common denominator by which the resource position of one mineral commodity can be compared with that of another.

On the other hand, this statistical approach is not wholly satisfactory because of implicit assumptions concerning constant capacity to produce and a changeless technology, and because it does not and cannot allow for many pertinent factors to which a statistical quantity cannot be assigned. A special hazard in using the statistical methods is that the results may be seriously misleading unless the qualifications are expressly stated and understood. As the results are best presented in graphic or tabular form, it is difficult to attach the necessary qualifications in a way that will command attention.

These deficiencies of the statistical approach lead some students to prefer generalizations that express the results in relative terms. One such generalization is the statement that the United States is well supplied with some commodities, is altogether lacking in others, and occupies an intermediate position with respect to still others. Other general classifications cover such aspects as the likelihood of new discovery or changes in technology. But such generalizations, however pertinent and useful, are no more satisfactory in themselves than are the purely statistical methods. The needs of those who use mineral-resources information are such as to demand quantitative appraisal. Both approaches, statistical and qualitative, are needed.

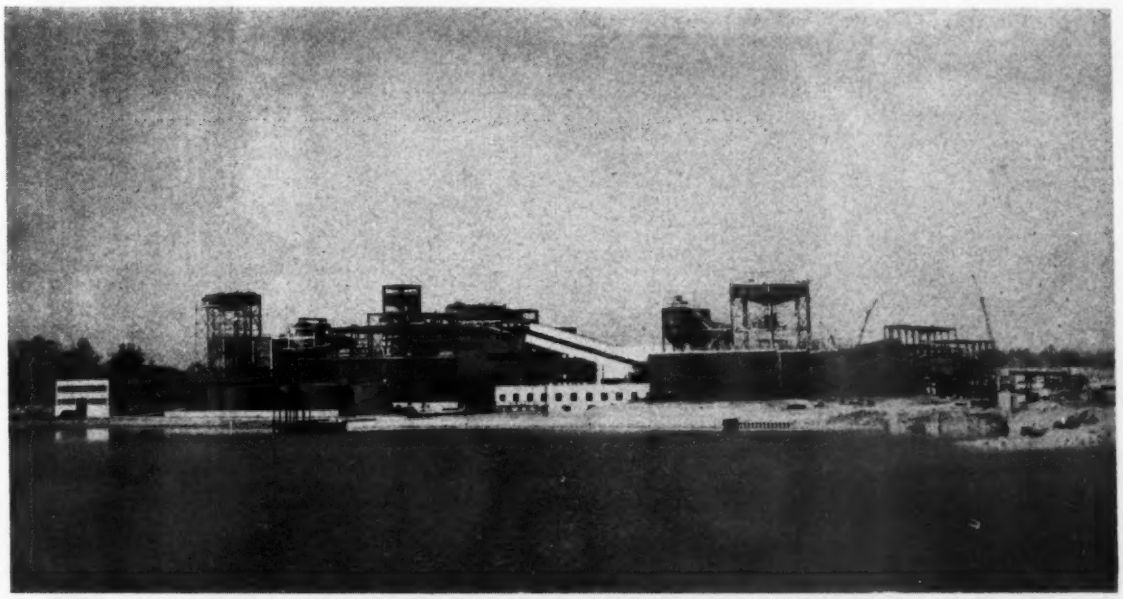
In either approach, the matter of allowing for future requirements poses a special difficulty. Patterns of use are continuously changing, and technologic improvements and discoveries are continuously arising.

Choice of a Yardstick

Considerations such as these deserve much thought in deciding what yardstick should be applied to estimates of reserves in order to interpret them in terms of national self-sufficiency. It is common practice in many fields of economic study to use a given calendar period, accepting the 1935-1939 average as representing "normal" conditions and the 1940-1944 average as representing abnormal war-time conditions. It is not, however, entirely sound to assume that postwar conditions will ultimately conform to a prewar standard. Part of the increased demand for metals and minerals that develops during a protracted war reflects normal technologic and industrial expansion; moreover, practices and uses established, at whatever cost, at the beginning of a war may become economic in peacetime because of efficiencies and modifications achieved by the end of the war. Changing social standards have an additional effect. Consequently, even though war years are abnormal in comparison with the years immediately preceding, in some circumstances and for some commodities they may represent a truer standard for consideration of the future. In addition, the productive flexibility of the mineral industry, as mentioned previously, is highly varied from one segment of the industry to another, and so the yardstick to be applied may be just as varied.

The use of a variable yardstick, appropriate to the commodity, is inherent in the method used by some mineral economists, in which the trend of past production and consumption is projected into the future. But here, too, there are difficulties. The basic assumption in using such trends is that they reflect at least the major factors that influence the result—in other words, the curve employed represents a formula that embodies all pertinent factors in weighted relation to one another. Unfortunately, that assumption is not always true; one influential factor not embodied in production curves is that of future discovery.

It would require a separate paper to amplify this discussion of the nature of national mineral-resource appraisal, with a discussion of how to go about doing it. The problem is admittedly complex and difficult, but perhaps it appears more so than it really is, because so little attention has hitherto been given it. The essential considerations are: The appraisal must start with the material in the ground; it must take into account all the factors—geologic, technologic, economic, and political—that influence the possible entry of this material into commerce and use; and the results of the appraisal must be correlated to the needs of those who use the information. The job will be with us as long as we use metals and minerals, and the need for it will become increasingly acute, to both Government and industry, as our raw-material resources are progressively depleted.



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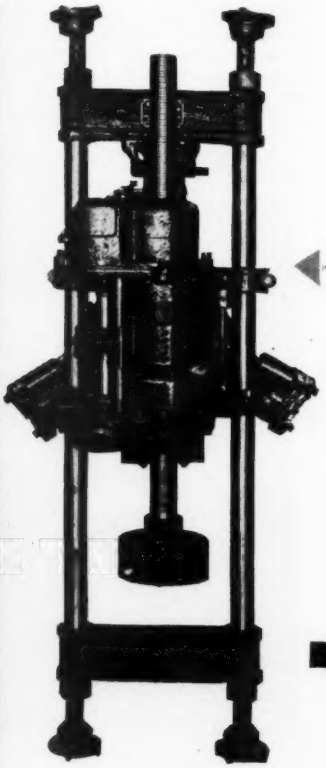

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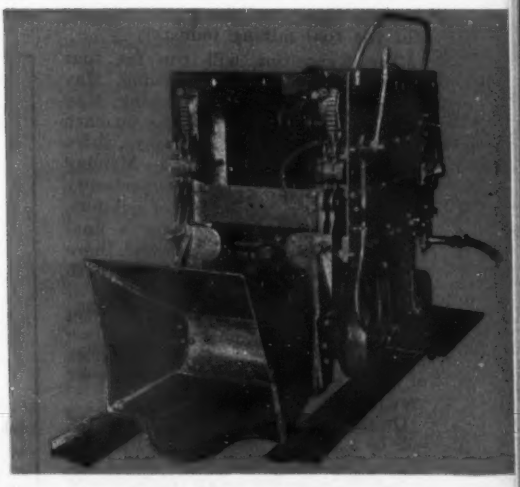

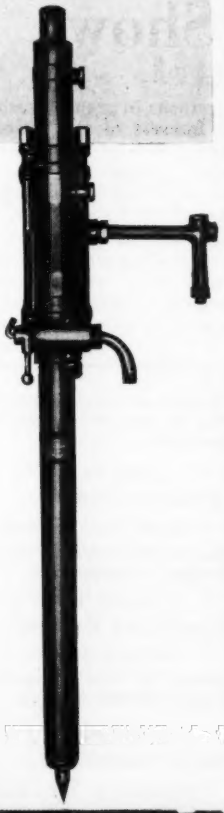

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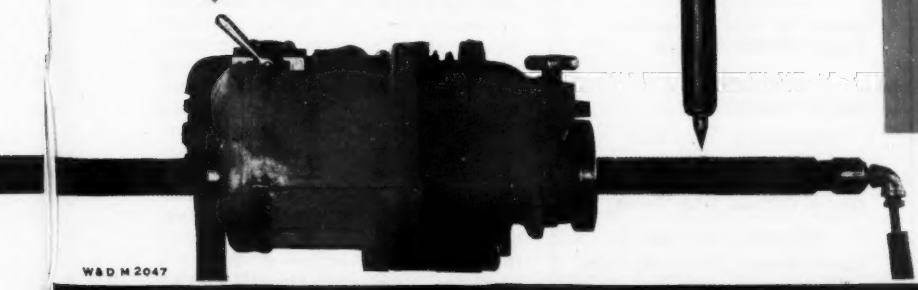

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Vital Topics Selected for Discussion at 1949 Coal Show

A BROAD variety of papers on subjects of both immediate and long-range importance to coal operators will be presented at the 1949 Coal Show in Cleveland, May 9-12. The machinery exposition on this occasion will be the largest ever assembled. Space has already been assigned to more than 190 exhibitors who will utilize a total of 91,000 sq ft in displaying their equipment and services for the coal mining industry.

The Exposition will run for four days, opening Monday morning, May 9, and closing Thursday evening, May 12, with Convention sessions on each of these days. On two half-days, there will be no sessions scheduled—Monday morning, to give ample opportunity for preliminary inspection of exhibits, and Thursday afternoon, for a final review and check up. In general, there will be three papers at a session with one or more written discussions of each presentation. However, several subjects cover a wide range of practices and will be covered by a series of short papers dealing with different viewpoints or aspects.

On each of the three mornings there will be a general session covering subjects of interest to all branches of the industry—research being conducted on the production of synthetic fuels from coal; progress in the experiments to develop underground gasification of coal; and the future demand that will be made on the industry for a coal that will compete in combustion efficiency and convenience with other fuels—and, as a corollary to this, surface preparation methods to prepare such fuels. Of equal interest to the entire industry are the problems of management, of training personnel, of attracting young men to the industry, and the promotion of mine safety.

There will be concurrent afternoon sessions dealing with problems of special interest to various branches of the industry. A session on trackless mining with conveyors and rubber-tired equipment will give particular attention to the new development of "continuous mining" as it is now in operation with several different types of machines. For those who use track-mounted equipment, there will be a haulage session dealing with locomotive trip controls, including telephone and radio communication between the dispatcher and moving trips. Another trend of interest is the recent developments in slope haulage to replace shaft hoists; this practice, originally used only for shallow depths is, with improved sinking methods and improved designs in conveyors, now competing with hoists for operating deep-lying coal.

There will be two special sessions on strip mining, with papers on the most modern open-pit techniques for anthracite and bituminous operations: methods and equipment for handling increased depths of overburden; drilling and blasting, with various types of explosives; power distribution; aerial photography, and strip land reclamation.

For the first time at a Coal Convention, the subject of mining steeply-pitching seams will come in for major attention; this will be at a special round table discussion on Wednesday afternoon. Men from widely flung fields will take part—from the Pacific coast, from the Rocky Mountain field, from Canada, from Pensylvania anthracite, and from Alabama. In addition to being of interest to those who operate in steeply-pitching coals, this session will also be of value to those who have seams where the grades lie close to the borderline of economic operation with conventional mining methods.

Outline of schedule for the sessions as prepared by the Program Committee:

Monday Noon

Welcoming Luncheon.

Monday Afternoon

Session A: Trackless Mining.
Session B: Maintenance.

Tuesday Morning

Research and Marketing.

Tuesday Afternoon

Session A: Face Preparation.
Session B: Strip Mining.

Wednesday Morning

Surface Preparation.

Wednesday Afternoon

Session A: Underground Haulage.
Session B: Strip Mining.
Session C: Steep Pitch Mining.

Thursday Morning

Management, Personnel and Safety.

Through adherence to a realistic policy, a modern community has developed at the isolated Climax property

Personnel, Safety, and Public Relations

A Program to Increase Efficiency by Solving These Industry-wide Problems

By W. E. JONES
Personnel Manager
Climax Molybdenum Co.

PERSONNEL, safety and public relations problems have advanced during the last 15 years to the point where they are among the first considerations of a mine manager when he is considering ways and means of reducing the cost and improving the efficiency of his operations. It is not to be inferred from this that the true importance of these problems has only recently been recognized. Many of these same problems were encountered and acknowledged in this country 40 or more years ago.

A marginal copper mine was being developed in Arizona about 1908. The management introduced a light, one-man drill to replace the heavier, two-man drill in an effort to reduce operating costs to a profitable level. The employes opposed the change and accused the company of trying to throw half the miners out of work. It took several months of explaining to convince them that this reduction in costs might be the deciding factor in keeping the mine in operation before they could accept the change. This is certainly not a new problem to present-day operators.

A conference was held in Ohio in 1916 to consider the need of a course in human engineering in the engineering curriculum. A similar conference was held in Columbia University in 1918. The General Electric Co., in 1919, turned a series of disputes over to a shop committee for settlement and was agreeably surprised at the promptness with which an acceptable decision was reached. Also, in 1919 it was suggested that preemployment physical examinations be given prospective employes.

About this time the National Americanization Committee of New York was giving increased consideration to the training of engineers in such matters as methods of employment, management, promoting and transferring employes, as well as incentives, industrial recreation, welfare, and housing and education for both the employe and his family. All the subjects, just mentioned, are still being studied, probably more intensively than ever before, to determine possible further improvements.

Mining operations and indeed all industrial operations require two types of machines, i.e., the mechanical machine and the human machine. To date the mechanical machine has received far more attention in an effort to maintain and/or improve its production record.

The human machine represents an equally fertile field in this respect and has only recently received its greatest consideration. L. J. Rosenstein, consulting psychologist and associate professor in the College of Commerce of Loyola University, in an address before the 35th National Safety Congress, stated that we might amortize a $2,500 machine over a period of ten years and add $50 per year for maintenance in order that we might get the most out of our investment. He added in substance, "do you spend $300 a year on a man that is working on a $2,500 machine or give the same careful consideration to his qualifications in meeting the need of the job for which you hire him as you do the machine and its adaptibility to

do the job for which you purchase it?"

Management's Problem

What can be done to develop a knowledge on the part of the employe that he is working for a company that sincerely makes every reasonable effort to provide him and his family with the things in life that they desire? What sort of program can be set up with this as its objective? Are mining operations such that attaining this objective is unusually difficult? What do employes expect of their employer? The answers to these and other similar questions are not easily found and even when they are known for a particular operation there is little assurance that they will be the same as those of mining operations in other districts. Such varying factors as type of mining, number of employes, climatic conditions, and living conditions as well as many others make it impossible to establish any specific answers that may be applied generally. However, it is nearly always possible to follow some general principles in obtaining the answers to this type of question regardless of the variables encountered.

These and other personnel problems are confronting the mine operator of today and they can probably be classified under three main headings:

(1) How can desirable people be attracted into the mining industry?
(2) Once they are on the payroll, how can they be kept there?
(3) When they quit or are discharged, what can be done to get them to speak freely regarding suggestions for improving working and living conditions?

The question of how to attract desirable people into the mining industry is one that is particularly important at present. By far the majority of the mining districts in the United States are today experiencing a very definite shortage of skilled underground workmen and in some areas a shortage of acceptable inexperienced workmen exists.*

After a prospective employe has been sold on the desirability of working in the mining industry and he has accepted a job, the next problem that logically presents itself is that of determining what can and should be done toward making him a satisfied and efficient workman who would like to become a permanent employe. This should be the ultimate objective of any personnel program.

It is true that many of the things that attract people into the mining industry, originally, also go far toward keeping them there. But it is equally true that unless there is an organized program directed toward this end, the results will be disappointing.

Elements of a Personnel Program

Personnel programs vary in details with local conditions and individuals but in a general way an effective program can be set up in the following manner:

(1) The management of a company must first analyze its own attitudes, policies, and objectives in regard to its employes and the community in which it operates, and then come to an agreement on the definite policies to be followed. It must be recognized at the outset, however, that any policies adopted must be carefully and honestly considered from the viewpoint of being absolutely fair to everyone concerned and that just setting up these policies does not guarantee success. Unless a company is willing to make every reasonable, sincere effort and bear the necessary expenses of obtaining satisfactory employe and community relations, the time spent in outlining the general policies, in all probability, will have been wasted.

(2) Once these proposed policies have been determined the next step is to see that the people affected understand them. By such means of communication as company manuals, meetings of employes, newspaper advertising, letters to employes, bulletin boards, and explaining the policies to all supervisors who in turn pass the information on to their employes, the details and meaning of these policies should be clearly and simply explained. Any suggested improvements or criticisms made should be carefully considered and if they have merit the policies should be altered accordingly.

(3) It is essential that these policies be accepted at all supervisory levels. Some in this group may be either definitely opposed to certain portions of these policies or possibly only half-heartedly in favor of them. It is these people who can (although they may be few in number) make it impossible for management to attain its objectives. Take for example a case where a shift boss is trying to carry out a policy to which his foreman is opposed even though he knows it to be a company policy. The person involved may not be satisfied with the decision made by the shift boss and will carry his case on up to the foreman. The foreman may reverse his bosses' decision and after a few such experiences the boss gives up trying to enforce this particular policy. In another case, a mine superintendent might not be sold on the value of a certain policy, and consequently make little or no effort to see that his supervisors followed it.

(4) Once these policies regarding employe and community relations are operating it is advisable to organize a program for evaluating not only the employe's but also his family's attitude toward them. In addition, channels of communication must be set up whereby any suggestions regarding community conditions or working conditions will receive consideration by the proper company official and his decision as well as the reason for it, made known. It is difficult to overemphasize the importance of this fourth step. There are several possible methods of making these attitude surveys and the selection of one of them or any combination of them will depend on local circumstances. Sometimes a disinterested third party such as a consulting firm is brought in by the company in order that the employes will feel like talking more freely. A questionnaire could be circulated by either the union or some other employes' organization, if there is one, or by the company. Possibly certain old-time employes who are leaders and have the confidence of their fellow workers could talk to other employes and their families personally. There are always certain employes of the type just mentioned who, because of the nature of their work, come in almost daily contact with many other employes and they could be used for this work. Such people as doctors, nurses, members of the personnel and safety departments, guards, and recreational supervisors might be satisfactory.

What Employes Want

Another method that is used sometimes to determine what can be done to keep employes on the payroll is to anticipate their desires and needs without actually consulting them. It is true that in a general way the following consideration will probably be satisfactory in describing the needs and desires of employes:

* This topic is covered in detail in a paper by Bryon E. Grant, beginning on page 45.

(1) Employes want to feel secure in their jobs, and to know that if they do their part, the company will, in turn, do all it can to give them steady employment.

(2) A reasonable chance for advancement to more desirable and better paid jobs should exist.

(3) The wages paid should be in line with those for similar work in the district.

(4) Employes expect various types of benefits such as group insurance, recreation, medical plans, pensions, and paid vacations, to be furnished at a reasonable cost to them.

(5) A feeling of belonging on the team. They want to know that their work, however insignificant it may be, is an important part of the entire operation. They like to know that when something comes up that will affect them, they will have a chance to voice their opinions and their opinions will receive careful consideration before a definite decision is reached.

(6) Employes are interested in the business prospects of their company. An explanation of some of the company's problems is usually appreciated and helpful in improving employe relations.

(7) The company management must be fair, sincere, reasonable, and considerate in its dealings with its employes and their families.

Recent surveys in a number of industries revealed that the features of jobs appealing most to employes, were in the order of their importance: job security, opportunity for advancement, rate of pay, and benefits such as pensions and insurance. This gives an indication of what subjects should receive first consideration when looking for causes of employe dissatisfaction.

The chief disadvantage with this approach is that while it may be correct in a general way, there are likely to be specific instances where the actual causes underlying employe grievances will not be known unless the employe is consulted. In such cases as this it is easy to do the wrong thing with sometimes quite disagreeable results.

When it becomes necessary to discharge an employe or he quits, every reasonable effort should be made to see that he leaves with a feeling that he received a fair deal and that the company was sincere and persistent in its effort towards this end. A well-planned exit interview in which it is explained that the company would appreciate any suggestions made for improving conditions thereby making them more satisfactory for employes is worthwhile. At the same time possible causes of any dissatisfaction can be considered, and he may leave with the feeling that it wasn't such a bad place to work after all, and that he might like to return sometime. There is no better medium of advertising for a company than a group of satisfied employes or of former employes who speak well of their ex-employer.

Solving Safety Problems

The safety problems encountered in mining can be grouped under three main headings:

(1) Engineering problems. These are not nearly as difficult as formerly because a satisfactory solution can generally be obtained through information available from sources such as: Explosive companies, U. S. Bureau of Mines, state mine inspectors, industrial commissions, equipment manufacturers, and organizations specializing in safety equipment who are glad to be consulted on safety problems. They bring a background of years of experience to bear and it is seldom indeed that a practical solution isn't found.

(2) Another problem of long standing is that of getting company management and supervisors to realize the importance of safety and industrial hygiene programs not only from a humanitarian and financial point of view but also from the standpoint of improved employe relations. Here again the problem is not as difficult as it was in the past because of the actual experience of many mine operators and such organizations as the National Safety Council, the U. S. Bureau of Mines, and the state industrial commissions. Some state mining associations have accumulated sufficient data to convince most operators that it is to their advantage to have a well-organized safety and industrial hygiene program. The experience of many mining companies in obtaining a marked reduction in compensation insurance rates through safety

Both underground and topside the best facilities are provided for Climax workers and their families. Hotel, above; school, below

programs is also a convincing one. In addition prospective employes consider the safety of an operation before accepting employment, and it is becoming increasingly common for unions to insist on a clause in their labor contracts to the effect that the company agrees to provide a satisfactory safety and industrial hygiene program. In the face of these considerations it is more easily understood why the job of selling employers on this type of program is a comparatively easy one.

(3) Convincing the employes themselves of the value of safety and industrial hygiene programs is probably the most important as well as the most difficult problem facing the safety engineer today. It is not too difficult to issue regulations, formulate policies, write rule books, and prescribe penalties for failure to follow them. But it is extremely difficult at times to convince the employes that the company is sincere about safety and wants the employes to be the same way. What can be done to put the employe in a frame of mind where he wants to do his work safely rather than cut corners and take chances when his boss isn't looking is something that has never been satisfactorily solved. Many things, depending on local conditions, have been tried but none of them has been completely successful. In some districts penalties have been prescribed for failure to follow regulations and in others some regulations are not made mandatory and compliance is obtained by talking, showing, setting an example, and explaining their value and importance to the employes. Where the employes have an opportunity to assist in formulating and approving their own safety rules compliance is noticeably better. Some classes of safety equipment have been furnished employes free or at a reduced price in an effort to encourage its use. These and many other approaches have been tried and the problem still exists.

Improving Public Relations

Public relations is a field which the mining industry has neglected somewhat and has failed to apreciate its advantages and importance. The public's opinion of an operation is based on whatever facts have been presented and if only one viewpoint has been expressed, it is evident that the public's attitude will be biased.

The sort of information commonly available about mining enterprises in the usual daily newspaper deals with disasters, excessive profits, labor troubles, unsafe working conditions, and unsatisfactory living conditions. It is seldom, except in the various technical publications which the general public never sees, that the other side of the picture is presented. Mining companies should take pride in seeing that the public gets a fair and unprejudiced picture of their operations. Among the more important advantages that may be derived from good public relations are:

(1) Much favorable advertising can be had at little cost through prepared press releases.

(2) Publicity regarding employes and their activities increases their pride in the company.

(3) An unbiased picture of situations involving labor, effect of government policies and regulations, or business conditions can be given to the public direct from the company.

(4) By directing information to community leaders in various organizations a greater interest is aroused in the community which is beneficial to the company.

Here are a few methods of presenting information to the public that have been used:

(1) Arrange plant tours for various business and civic organizations as well as wives of employes that will give them a clearer understanding of some of the major problems involved in the operations.

(2) Mail circular letters periodically to community leaders and also to employes who will spread the information.

(3) Prepare suitable press releases regarding such things as employe activities and company plans, prospects and policies.

(4) Arrange for a booth at a state fair or similar local functions where information and exhibits of company activities are available.

(5) Invite reporters in and see that they obtain factual information on newsworthy events.

This is certainly a field that the mining industry can well afford to give serious consideration.

Practically all of the problems stressed throughout this discussion have been problems in which human beings play the most important part.

It is recognized and accepted that a person's presence can be bought, his hours on the job paid for, that regulations can be laid down to govern his movements while on the job, and that labor and management can deal with each other certain legislated conditions. But there are no regulations, laws, or money that can obtain an employe's enthusiasm, initiative, loyalty, good will, and his spirit of cooperation. These, company management must earn.

Employe attitude toward a company are largely dependent on the company's attitude toward the employes. A carefully planned, well-organized personnel relations program is the most effective means of obtaining these desirable attitudes and the time and money required will certainly be repaid many times.

Housing similar to this helps keep employes content

Attracting Men to the Mining Industry

By B. E. GRANT
General Superintendent
U. S. & Lark Mines
U. S. Smelting Refining and Mining Co.

Public Relations—Selling Labor on Improved Working and Living Conditions—Will Accomplish Aim

IN THE matter of attracting men to the mining industry, many able men have tried their hands and have had considerable experience. Their efforts have met with limited success. But if more good men are to be attracted to the mining industry something in addition to our present and past efforts must be done. On this subject three statements have been made as follows:

(1) "Better housing, better educational and recreational facilities, and a greater recognition by mining company executives of their responsibilities to the communities in which they and their employes live are needed if more desirable men are to be secured and kept in the industry."

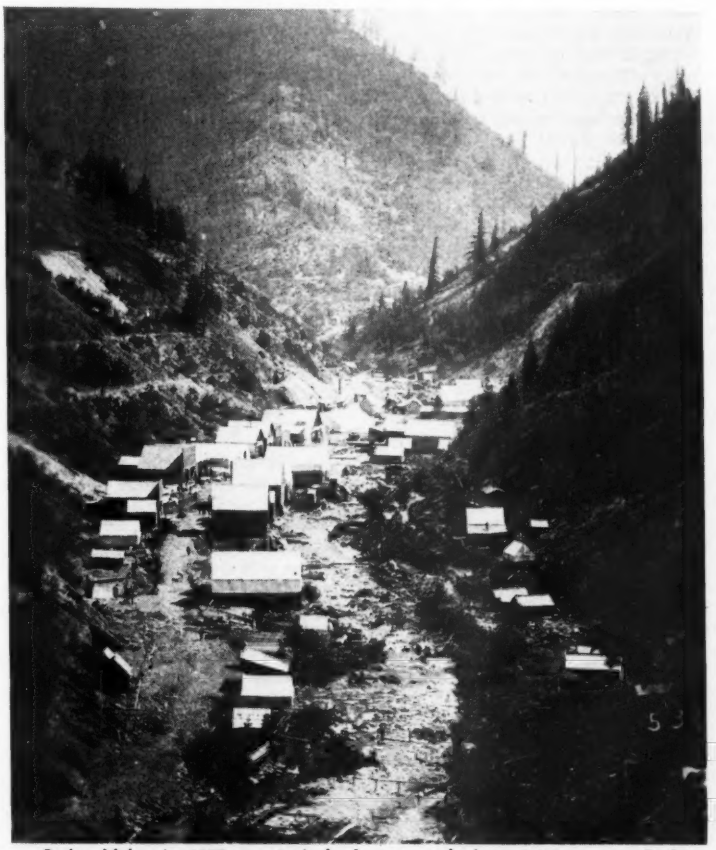
(2) "What can be done to offset the widely held public opinion that mining is a dirty, dangerous profession, that every man who goes underground takes his life in his hip pocket and may lose it, and that no self-respecting American engages in mining except as a general manager? What future is there for a young man in metal mining?"

(3) "The present-day miner has tools and equipment far different from those of a few years ago. A higher degree of skill is now required of a miner because of increased mechanization of all underground work. Advantages of mining as a vocation should be advertised. One seldom sees a newsreel or a newspaper article relating to a mine that is not in some way connected with a disaster."

There is no panacea to offer that will cure our manpower requirements. The present labor market is the tightest it has been in at least two decades, and perhaps longer. Employment in the United States has reached an all-time high. Few competent, able-bodied, work-willing men are unemployed. Short of a major recession, competition in the over-all labor market is not likely to decrease. It is more likely to increase. It follows, then, that the efforts of the mining industry in competing for labor must be increased.

Members of Industry State the Problem

In order to better define the problem a number of superintendents, managers, presidents, etc., throughout the West, who represent a fair cross-section of mine operations, have been contacted. The consensus of opinion was that (1) There *is* a pressing need for more maintenance and production employes throughout the industry. There is only a minor shortage in craftsmen. (2) The over-all quality, work-ability or work-attitude of the present working force is considered to be average or below. Most operators think the quality of the present working force is below that prior to World War II. Transient labor and high absenteeism plague most operations. Operations with intensive employe-training plans, in which Anaconda's operations in Butte are outstanding, appear to pay dividends in gaining labor. (3) Most operators report they are experiencing little difficulty in obtaining a sufficient number of supervisory employes and engineers. The situation may be



Burke, Idaho, in 1887 was typical of many early-day mining towns. Such conditions would offer no attraction to present-day miners

somewhat altered if each operation had a sufficient number of production and maintenance employes. (4) All operators are fully aware of the problem and are training young, competent men who may fill, when the need arises, the shoes of the higher supervisors, but most operators express a doubt that there is a sufficient number of young, competent men employed in the industry. (5) No operator contacted has a hiring or recruiting agent out in the field. The opinion seems to be unanimous that this method is ineffective. (6) Each operator considered the degree of mechanization in his operations to be above average which indicates the progressive attitude the mining industry is taking in supplying its employes with modern tools and equipment with which to work. (7) There is a lack of definition in public relations programs in effect.

These statements strengthen the conclusion that we need to bring additional men into the mining industry. First we should endeavor to reclaim those men who were skilled in the mining trade but who now are engaged, as a result of war time transition, in other trades. Although this suggests proselyting, there just aren't enough good men to go around. While an individual operation may benefit temporarily, we do not solve our problem and it does us as an industry no good to attract miners from one mine or one mining locality to another. The transient miner makes the poorest employe. It is he who lowers the over-all quality of a working force. Such an employe has no primary interest in the welfare of operations and his presence on the payroll only lulls his employer into a false sense of production anticipation. Second, we must gain new recruits and train them to become skilled employes. Third, we must conclude that we can't solve our manpower requirements overnight.

Good Public Relations Needed

To attract men more permanently to the mining industry we must broaden our sight, shoot further afield, and well into the future. The problem is one of more aggressive public relations. We must rebuild the roof instead of patching it, and level attention on the youngsters coming of age. Our job is to project ourselves into our community's housing plans, educational, and recreational programs. Larger cities fare well by themselves. The communities that surround the mines, mills, and smelters, are relatively small. They depend upon the mining industry for their major source of tax revenue. These are the communities in which the majority of our employes live and from which other employes must be gained. If they aren't there now, of assurance they must move in. The dominating opinion in these communities directly affects operations; helps shape labor policies; determines whether the young men enter the immediate field or seek work elsewhere. The recreational, educational and industrial facilities, in, or in near proximity to these communities determine the living standards and hence the type of community residents, the permanency of their residence, and the increase or decrease in number of residents. To be most effective, projection of interest must be one of cooperation and not one of domination. The people of our communities, the local or district boards of education, and the local service clubs solicit our cooperation but openly resist any group—industrial, labor or otherwise—who tries to dominate. That just happens to be a fundamental principle of Americanism.

Constructive Programs Begun

Some metal mining companies such as Bunker Hill and Sullivan and the Sunshine Mining Co. in the Coeur d'Alenes are taking the initiative in constructing comfortable and substantial homes to be sold at a most reasonable cost to their miners. These projects were reviewed in the August issue of *Engineering and Mining Journal*. Geneva Steel's and Henry Kaiser's coal mining units at Dragerton and Sunnyside in Utah are following a similar pattern in building and selling homes to their miners. There may be others not noted here. These companies should be commended upon their farsightedness. Because today's miner is more skilled than a decade or so past and his standard of living has risen sharply and is still rising he is not content with an unkept house with "Chick Sale" improvements. He is becoming more and more demanding in the type of house he will occupy. Furthermore, he wants to own it, and if he does he is, in all probability, a more satisfied employe. Mine employes will buy homes in an area where there is an indicated long life of the operation or where a diversity of livelihood exists, and, hence, a resale value to the home. All mines are not situated in such a locality. This does not lessen our responsibility. Mine operations whose circumstance of location in respect to established communities dictates as unwise the building of homes on or near the company property might well review from time to time their manpower requirements with companies and contractors engaged in the building business who can be encouraged to build homes in communities within commuting distance of the mines. Homes are built where a demand is proven. We must get actively in the field now to insure that when and if housing catches up with demand that a sufficient number of those houses will have been built in areas that will benefit the mining industry.

In this matter there is one other item to consider. Additional homes in a community means more people, more school children, more of everything—especially taxes. In general, there is even a greater shortage in school housing than in residential housing. In the Jordan School District in which Bingham is located, school houses are overflowing with youngsters. Classes, in some instances, are being held in the halls. Mining companies with operations in the District have cooperated with the District Board of Education in planning construction of new school buildings, additions to others. At least three of the five-man board have volunteered their expression of appreciation in the cooperation and good will extended by the mining companies. If we encourage the building of additional homes to gain additional employes and this means additional schools, roads, sewers, etc., then we must also be willing to accept the ad-

Bunker Hill's new housing project will provide comfortable homes for capable miners

ditional tax costs involved. We want good, conservative spending of our tax money, but pinching the school budget is not proper conservation. If we have the good will of those who direct the lives of our young folks, we will also have the good will of those young folks. We can't sell our product to an unfriendly client.

Mining Must be Sold to Labor

Our job is one of selling. In this matter of attracting men to the mining industry we have been in the buyers' market. We must about face and get into the sellers' market. The products we shall sell are our own good will and fellowship of which we have an abundance; our many contributions to industrial, scientific, and professional advancement; our contribution to our communities, states, and nation in creating wealth in wages and taxes and in supplying raw material from which when fabricated and in the processes of fabrication even greater wealth is obtained; and more directly, the many social benefits such as insurance, medical, and hospital plans enjoyed by our employes; the high degree of mechanization employed in our operations; the elaborate ventilation and air cooling system installed in our mines; the change house facilities; the modern surface shops, and the well-regulated safety programs.

The ways we shall sell these products are varied. Selling our good will to our educational groups is only one way. We can pick out the facts of our industry that will make interesting copy, prepare these facts into interesting stories and present them to the local papers. If we go to the papers only in times of mine disaster or labor troubles then, of course, that is the only copy that will be printed. A good job has been done by Bert Brewster in his Shift Boss and Old Timer columns featured in the *Salt Lake Tribune* in selling the mining industry to the public.

We can send representatives into the field to discuss problems and accomplishments with community civic clubs and other groups. Don't forget that the women are just as important as the men. The Utah Mining Association is sponsoring a program of selling mining directly to the public by means of making speakers available to schools and civic clubs throughout the state. Civic clubs are anxious to gain speakers. It is amazing how little the average layman knows about the mining industry. Through open discussion we can dispell many of the fears and bugaboos that now keep men from mining their occupation. Service clubs have shown keen interest in such facts as these: In the State of Utah mines and mining claims account for approximately one-sixth of the total assessed valuation. The mining industry supplies directly or indirectly a livelihood for 47 percent of the people of our state. Incidentally the situation is not too different in several other western states. Wages within the mining industry are among the highest paid in any industry. Through industrial medical services together with employe medical and hospitalization plans, to which most mining and smelting companies contribute generously, the employe in the mining industry has his health needs attended to at a negligible cost to him. Employes participate in low cost insurance. Holiday and vacation privileges are equal to, if not better than, other comparable units of industry anywhere. Mining companies *are* concerned with the welfare of their employes and are continuously contributing to the health and welfare of the men engaged in mining occupations.

More Brain and Less Muscle with Mechanical Mining

To accomplish the present degree of mechanization in our industry huge sums of money have been spent. For instance, the tools of a crew advancing a drift underground a decade or so past consisted of two hand shovels valued at $3 each, a hand-cranked Leyner machine and arm and bar valued at $550, a few mine cars and some incidental tools and the crew was thought well-equipped. Human muscle was the driving power; headwork and skill were secondary. Today the drift crew does little or no hand shoveling—a $2700 loading machine is used instead. The drills are automatic-feed Leyners mounted on a $2000 jumbo with gadgets and racks at command. A $7000 locomotive pushes cars past a $200 cherry picker which swings back on the track an empty car which the motor pushes back to the drift face. Headwork and skill are the driving power; human muscle is secondary. This same degree of mechanization is employed in all other units of work in the mining industry. The job is more desirable; the previous muscular drudgery is eliminated.

And, for the college trained men, what about the engineering, geological, and geophysical problems yet to be solved that should challenge the skills and ingenuity of the young men aspiring for recognition if only these young men knew that such problems exist and that the field is still open. They must know these facts early in their schooling period while they are choosing their course of study. We are not a "have-not" industry in raw products to be mined, but in the future, operators must have better training and more skill to mine and beneficiate these products and find new products to be mined. The job *is* getting tougher.

Selling Mining to Future Key Men

The U. S. Company early last spring sent out letters to representative colleges and universities all over the United States offering underground employment to, and requesting applications from undergraduate or graduate students wishing to work in the mines. In due course, 57 such students representing 21 different colleges and universities were employed in the Bingham mines. All were undergraduate students except four. One graduate student is the product of one of four scholarships in mining-milling-smelting offered under a competitive basis to sons of U. S. Co.'s employes. Also in the group, other than those students majoring in some phase of engineering, were students majoring in languages, business, journalism, medicine, law, dentistry, personnel management, speech, and political science. These young men taught us much and they learned something from us. Judging from the many comments these young men will scatter our good will to many parts of the land. Several have indicated their desire to return to the mines again next summer. But of greater importance, these young men have viewed at first hand some of the problems that will later confront them in mine operations and they have gained new ideas concerning their future studies. In part, by the above, means and through the scholarship program, the U. S. Co. hopes to keep employed young technical men who with sufficient experience and training may later engineer, supervise, and manage the operations. Of course, non-technical men are now and will always play a major role in supervision.

Most mine operations in the Western United States have passed beyond their first and second generation of operators. In those generations the incentive of ownership dominates. Big incentive breeds big accomplishments. As each generation of operators succeeds another, the incentive of ownership becomes farther and farther removed. To be of most value, the aspiring young executive must start at the very bottom in an individual operation and work his way up. He must first learn the operation and its past history to understand the present. Years are consumed. If he has much on the ball, his income is secondary to his aspirations. This young aspirant at the outset must be sold on mining for the love of mining. There must be within the organization with which he is associated a feeling of warmth, cooperation, and attainment. These are his incentives. Remember he is investing his years of college training and his future in the operations. We must keep him sold to retain his investment.

New Coal Mining Machine

Hard bone in the Kent mine of Rochester and Pittsburgh Coal Co. is mined with the coal by the ripping action of this new machine

Continuous Miner Announced by Joy Mfg. Co.

ON December 14 and 15, the Joy Manufacturing Co. publicly announced the Joy continuous miner, which is designed to mine coal at the rate of two tons per minute. This machine has been developed from basic ideas conceived by H. Carson Smith and carried forward by Harold F. Silver of Denver.

In September 1946, Joy representatives investigated the continuous mining machine invented by Mr. Silver and concluded arrangements for its manufacture and sale. Work already in progress by the Joy organization to design a machine to mine coal continuously was stopped and full attention was focused on improvement of the Silver design. Several experimental machines were built and tested, then modified and redesigned for commercial use.

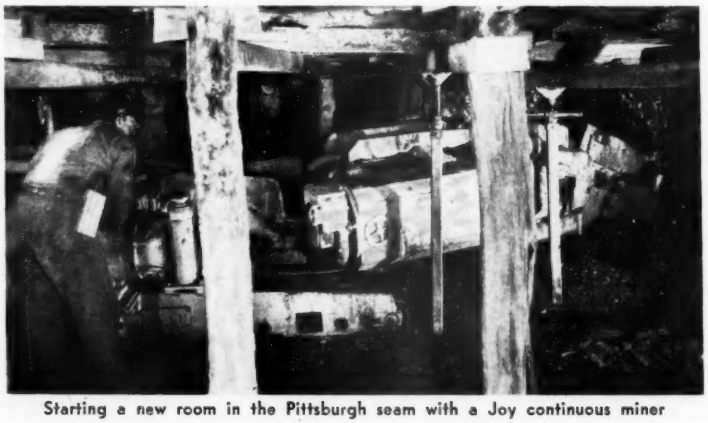
Essentially the continuous miner consists of a ripper bar or head which tears the coal from the face, discharging it into an intermediate conveyor which in turn discharges the coal into a centrally located hopper. From this point, the coal is picked up by the tail conveyor which carries it to a shuttle car. The entire machine is self-contained and mounted on caterpillars.

The ripper bar is 30 in. wide, equipped with six chains, each containing 20 replaceable bits. Each chain is driven by a separate sprocket on the main driving shaft which is attached at each end to a gear reducer that advances with the ripper head. A telescoping, splined shaft in a torque tube allows the reducer and ripper bar to move 18 in. with respect to the drive motors. The unusual design of the torque tube reduces transmission of chattering and vibration from the ripper bar to the drive motors. In operation, the 120 bits of the ripper bar performs a picking action which literally tears the coal from the face. Water under high pressure, sprayed while mining, maintains the unusually coarse dust produced at a minimum.

In over-all height, the Joy continuous miner is 34 in. for the low model and 48 in. for the high model. Its length is 25 ft 6 in. and it is 7 ft 6 in. in width. The machine can drive a place with a width ranging from 10 to 17 ft. The low model operates well in seams from 40 to 60 in. in thickness. The high model operates in seams varying from 54 to 96 in. in thickness. Thus, the unit may be used in a majority of US coal seams.

Coal Ripped from Face at Rapid Rate

The continuous miner operates as follows: the machine travels on its caterpillar treads to the face of the room; the ripper bar is swung either to the left or right of the working face, its position being determined by the width to be mined. The ripper bar is then lowered to the floor of the seam and advanced or "sumped" into the coal for its full extension of 18 in. by hydraulic pressure. Then the ripper bar is elevated, digging into the coal as it progresses to the top of the seam. After completion of a cut, the ripper bar is retracted, lowered, and swung 30 in. to face the uncut coal. These cyclic movements are repeated until the desired width of place is



Starting a new room in the Pittsburgh seam with a Joy continuous miner

Entries driven with continuous miner have a smooth, curved face

mined, at which time the machine advances forward 18 in. on its caterpillar treads and the mining cycle is repeated. The time required for making a single cut of 30 in. width and 18 in. depth has varied from 23 to 40 seconds. Under actual operating conditions from 5 to 6 minutes are required to advance a face 14 ft wide, a distance of 18 in. at the center of the face.

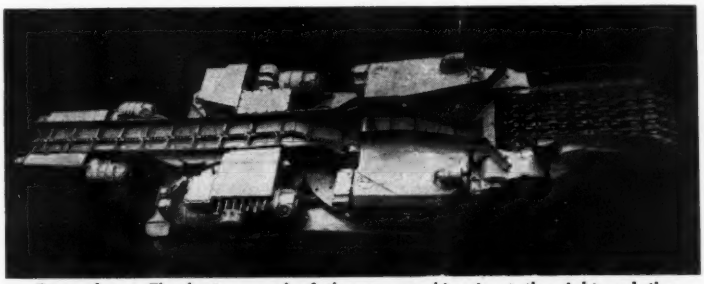
A total of 162½ hp operates the continuous miner. Two 65-hp main drive motors furnish power to the ripper bar. A 7½-hp pump motor powers the hydraulic system which controls the elevation and swinging of the rear conveyor, operation of the timber jacks located immediately to the rear of the ripping head unit, the scoop that accumulates the fines that collect below the ripper bar, swing of the ripper bar, sumping in, and shearing. Safety switches provide a means of immediate cutoff for all the motors. Each tread of the caterpillar drive may be operated independently to swing the machine to any desired position. The trailing cable of three No. 2-0 wires carries power to the machine.

Exceptionally long bit life has been obtained. Clay seams and sulphur balls have been cut with considerable ease. The bit life in relation to coal mined is 16 times the life of cutting machine bits. Experiences in one mine has indicated that bit costs of 1¾c per ton may be realized. The tearing action of the bits, which pick rather than cut the coal, tends to produce a smaller proportion of fines than is produced by conventional coal mining methods.

Using the shuttle car as a surge hopper at the end of the tail conveyor of the continuous miner and another shuttle car to convey mined coal to the main haulage system in existing operations has required from five to six men on a crew. More than 250 tons have been produced in a single day of operation and even better production results are expected to be realized in the future, according to operators' statements.

Flexible Design Makes Machine Adaptable

All features of the machine have been designed to provide an unusual degree of flexibility to permit efficient operations in varying thicknesses of seams, in the width of the rooms being developed, and in the direction of advance. The present models of the machine will accommodate room widths up to 17 ft. Ample clearance on each side of the continuous miner provides room for operation of the machine and timber setting. The miner can turn a corner to right or left and is thereby adaptable to existing mining methods. It also mines at an angle from the direction of coal haulage in order to remove pillars, develop new rooms, or make breakthroughs for ventilation.



From above: The business end of the new machine is at the right and the tail conveyor at the left

J. D. A. Morrow, president, Joy Manufacturing Co., states "The Joy continuous miner is designed to mine two tons of coal per minute. However, the actual speed with which coal can be mined, varies with the characteristics of each seam and of every mine in that seam. It also varies with the efficiency of the transportation system in hauling coal away from the machine.

"How near coal operators in regular production will approach the designed capacity of the machine is quite another matter. It depends on all the many variables and difficulties that arise in the operation of each mine and upon the skill, capability, and resourcefulness of the different mine organizations themselves in dealing with the problems encountered."

Actual Operations Demonstrate Value

A prototype of the Joy continuous miner has been employed in the Illinois No. 6 seam where the coal is 6 ft thick. Mining is conducted there by room and pillar methods and rooms are driven 12 to 14 ft wide with butt headings or room entries driven 11 ft wide. A 12 to 14-ft pillar is left in place. The continuous miner is used for developing butt heading and driving rooms. Approximately 56-60 percent extraction is realized.

In a 50-in. seam of coal in West Virginia, entry development work is being done with the continuous miner. Entries are driven on 80-ft centers and are 16 ft wide. Six parallel entries are driven with break-throughs placed at intervals between the pillars which will be recovered later.

In 7-ft coal in the Pennsylvania-Pittsburgh seam a continuous miner is operating in a room and pillar retreating system. Rooms are 13 ft wide at 90 deg to butt headings which are 12 ft wide. The pillars are 12 ft in width and are extracted by the continuous miner starting at the back of the room and working out to butt heading by removing a series of slices at about a 75-deg angle to the pillar. Small triangular stumps remain and better than 90 percent extraction is claimed. Crossbars are set at 30-in. intervals. In a 46-in. (lower Freeport) seam in central Pennsylvania, the room and pillar system is being used with rooms 16 ft wide and approximately 14-ft pillars are left. Ventilation crosscuts are driven every 40 ft. No timbering is required except where faulted areas are encountered. Extremely hard bony in the faulted area is readily mined with the continuous miner. Haulage at this mine is done with two 3½-ton, cable-reel, shuttle cars, one of which acts as a hopper car. Belt haulage is employed in the butt headings. Five men make up the crew, which includes the man in the main line haulage to shift mine cars under a butt belt conveyor.

In the Colorado Laramie lignite 7-ft coal seam, rooms are driven 14 ft wide, entries 11 ft wide, and 26-ft pillars are formed. Occasional ten percent grades have been encountered. Where pillars are recovered, 86 percent extraction is achieved. In this particular mine the need for timbering has been virtually eliminated by the continuous miner. As much as 115 ft of entry has been driven in a single shift.

The Joy continuous miner sells for $47,500 and is approximately equal to the combined cost of the cutting machine, drill, and loading machine that would be normally required to mechanically mine coal.

Core sections are loaded on pallets for removal from drilling area

Core-Drilled Shaft for Ventilation and Escapement

Shaft Sunk at Low Cost Improves Mine Air and Increases Safety

By PAUL T. PORTER
Chief Engineer
The Lorain Coal & Dock Co.

THE Lorain Coal & Dock Co. of Blaine County, Ohio, is mining the No. 8 seam or Pittsburgh vein. The Blaine mine has been operated since 1910 with a daily tonnage of from 3000 to 4000 tons, and an extensive area has been mined. The mine was opened from the eastern side of the property and the western property line is about 3½ miles from the portal.

In 1947, additional coal property was acquired and it was realized that an escapeway would have to be provided closer to the working faces. Locations and prices were investigated. The possibility of drilling a 48-in. shaft by the core-drilling process was given careful consideration since its cost would be from one-eighth to one-tenth of that of a conventional slope or shaft. Savings made possible by lessening the travel time for the men getting to their working places, versus the difference in costs of the two methods of making an opening from the surface to the mine, favored the 48-in. drilled shaft, and a contract was entered into with the Pennsylvania Drilling Co. of Pittsburgh, Pa.

Upon acquisition of the additional coal acreage entries were developed toward the proposed shaft and about April 15, 1948, the drilling company moved its equipment to the site of the shaft.

Since this method of core-drilling uses shot as a cutting medium, it is important that the drill rig be set up perfectly level and be centered over the proposed shaft. As the drilling starts from bedrock, the unconsolidated materials from the surface to bedrock must be removed by manpower. Then a steel shell is centered in this space and the annular space outside of this steel shell is filled with concrete from bedrock to the surface or to where a perfectly level concrete base is made for the drill.

Actual drilling was started about May 10, 1948. As in most drilling operations, cave-ins occurred and springs were encountered. These were easily sealed off by special cementing methods. The drilling of this 48-in. shaft—the largest as well as the first to be drilled into a coal mine—was complicated by a lack of knowledge of the rock structure and beds overlying the coal. The work had to proceed rather slowly at times. Some of the cores either would not break as desired or would break up into segments laterally or diagonally. This made it necessary to lower a man into the hole to trim the core so that the core lifter could grasp it. If the core was not of such material that it could be lifted, it would be blasted and loaded out by hand. On October 9, 1948, the shaft was connected to the mine, a total distance of 202 ft.

The drilled shaft was not lined, as the smooth-cut, rock wall made this unnecessary. The only wall treatment required was the grouting off of water and the sealing off of

Extracted from a paper presented at the 1948 annual meeting of the Coal Mining Institute of America.

several weak fireclay beds. These were taken care of by reaming the shaft to a large diameter and pouring a ring of cement that was left flush with the shaft wall.

The entries leading to the proposed shaft were started some time before the drilling began and were finished ahead of the drilling operation. Not knowing definitely at the beginning whether the new opening would be a shaft, slope, or a 48-in. hole, four entries were driven abreast so facilities would have been available for man-trip cars, supply tracks, and proper ventilation as well as a neutral air course entry for a manway escapement. The total distance from the main haulage entries to the proposed new opening was about 600 ft.

About 450 ft of entry had been driven when the contract for drilling the 48-in. shaft was signed. The need for portal facilities was eliminated so two of the entries were stopped and the others driven the remaining 150 ft. They were driven at about 45 deg to the left of the four entries to the point where the shaft would connect. This was planned to permit a better method of taking care of men coming into the escapement entry in case of emergency.

Airlocks Provide Flexibility

Normally this 48-in. shaft will be used as a partial exhaust of the mine ventilating air current. Since the primary purpose of the shaft was as an escapeway, air was directed away from the manway entry. This was done by making an airlock just outby of where the two entries were turned at an angle to the left. The inner door of this airlock is located close to the angle turn. Inside of the airlock and near the inner door is a device which permits men to close either one or both of two doors in the normally return air course without exposing themselves to noxious gases, smoke, or foul air. Thus the course of the return air to the outside may be changed, making the shaft an independent airway.

In addition to the escapement entries, an additional entry was driven on the right side of the main haulageway entries, to be used as a neutral manway escapement entry. At intervals of approximately 300 ft, entrances to this escapement entry will be provided. This entry is connected by fireproof overcasts across the main west entries to the airlock in the entry directly connected with the bottom of the shaft.

In most cases of emergency, this neutral entry would permit workers to travel safely to the bottom of the shaft or the airlock, where they could wait until standby facilities at the top of the shaft could be placed in operation. These facilities include a circular steel casing, a bullet-shaped cage connected to a permanently-fixed derrick, and a hoist rigging powered by a gasoline motor.

Entrance to the cage is made by opening a door to a steel portal welded to a steel cylinder connected to the shaft and extending about 15 ft above the normal level of the surrounding terrain. The cage, equipped with a circular, sliding door, completely encloses the men when it is being lowered or raised.

Circular cage stands ready for use above steel portal

Directly connected to the hoist motor shaft is an emergency fan capable of producing about 10,000 cfm, air blows through an 18-in. steel tube connected to and through the side of the steel casing sitting directly over the 48-in. shaft. The cage will raise six or eight men on its single deck per trip. The emergency fan operates continuously whenever the hoist motor is in operation, and can be used to supply fresh air to the men at the bottom or to rescue crews.

With surface casing placed, the bottom is leveled off preparatory to drilling

Shaft Serves as Air Exhaust Opening

Although the shaft was drilled primarily as a safety measure, it was found that 50,400 cfm of air is exhausted by a natural split of the total ventilating current of a possible 84,000 cfm that the main fan produces. This condition has reduced the water-guage reading of the entire mine air by 1¼ in.

It was also noted that the main intake of ventilation showed the fan to be producing 82,400 cfm at approximately 400 ft from the fan, whereas before drilling the 48-in. shaft, the fan produced only 71,188 cfm. An air reading made at a point two miles from the fan showed 70,000 cfm compared with 52,125 cfm before the shaft was drilled.

It is likely that coal mines use more of these core-drilled shafts in the future because they offer a means of emergency escape at small cost compared to larger shafts, and because they may be driven in advance of planned mining, thereby keeping escapeways at a reasonable radius from working places.

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WHEELS OF GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

PRESIDENT Truman's message on the State of the Union to the newly convened 81st Congress carried in essence the points which he had stressed in his messages of last year and in his campaign declarations previous to the November elections. He called for continued credit control, regulation of speculation in commodities, export controls, transportation controls, priorities and allocations for key materials in short supply, extension of rent control, standby authority for price ceilings and limitation of "unjustified" wage adjustments, and a study of production facilities for materials in critically short supply, with authority for loans or even government expansion of such facilities if private industry cannot take up the slack.

A $4 billion corporate tax revenue bill was recommended to balance the budget. The President also urged repeal of the Taft-Hartley Act and reenactment of the Wagner Act, with prohibition of jurisdictional strikes and secondary boycotts and some means to prevent the use of economic force in industrial relations as well as means for remedial measures in strikes affecting the public interest. Congress was asked to raise the minimum wage from 40 cents to at least 75 cents an hour.

Further recommendations would extend the Trade Agreements Act in its original form; continue farm price support; approve the St. Lawrence Project; develop more valley authorities; keep title to coastal tidelands in the Federal Government; expand Government power facilities; enact civil rights legislation; provide universal military training; expand the Social Security system; provide a system of prepaid medical insurance; and grant Federal aid for education.

Discussing mineral resources, the message stated that, "In our present dynamic economy, the task of conservation is not to lock up our resources but to develop and improve them." It was then stated that the Federal Government must encourage the development of new sources of vital minerals.

In the organization of the new Congress, Senator Lucas of Illinois will succeed Vice-President-Elect Barkley as Senate majority floor leader, with Senator McKellar of Tennessee president pro tempore and Senator Myers of Pennsylvania majority whip. Senator Wherry of Nebraska is minority floor leader, Senator Taft of Ohio Chairman of the Republican Policy Committee, and Senator Millikin of Colorado Chairman of the Republican Conference. On the House side, Rep. Sam Rayburn of Texas is Speaker and Rep. John McCormack of Massachusetts is floor leader. Minority floor leader is Rep. Joe Martin of Massachusetts.

Immediately after convening the House approved a new rule which places great power in the hands of the Speaker. Under this rule, whenever a legislative committee approves a bill and the Rules Committee fails to clear it for a House vote after 21 calendar days, the Chairman of the legislative committee may call up the bill for floor consideration, regardless of the attitude of the Rules Committee.

Important is the naming of the following six new majority members of the important House Committee on Ways and Means: Reps. Boggs (La.), Combs (Texas), Carroll (Colo.), Young (Ohio), O'Brien (Ill.), King (Calif.).

Taxation

The White House request for a $4 billion revenue bill met immediate comment from Chairman Doughton of the Ways and Means Committee and Chairman George of the Finance Committee that they would have to see what the March 15 tax returns bring forth before taking any steps toward writing a bill.

Meanwhile Chairman Doughton has instructed the staff of the Joint Committee on Internal Revenue Taxation to continue its study and to work with the Treasury Department in preparing recommendations for technical changes and adjustments in the present tax laws. The Tax Committee of the American Mining Congress will meet January 26 for further study of certain administrative provisions affecting mining.

A bill to further suspend the 4-¢ copper import tax (now 2 cents as cut by the Geneva Trade Agreement) to March 31, 1951, has been introduced by Representative Patterson (Rep., Conn.). Leading domestic copper producers and consumers are understood to be agreeable to this measure.

Trade Agreements

The concurrent hearings of the Committee for Reciprocity Information and the US Tariff Commission on commodities to be included in the April 1949 negotiations at Geneva were concluded December 14. The countries involved originally were Denmark, the Dominican Republic, El Salvador, Finland, Greece, Haiti, Italy, Nicaragua, Peru, Sweden, and Uruguay. Colombia and Liberia have

Washington Highlights

CONGRESS: Convened January 3 and organizing committees.

PRESIDENT: Requests $4 billion Revenue Bill.

TAX: March 15 returns key to situation.

TRADE AGREEMENTS: Further hearings this month.

STEEL: Mining machinery allocation approved.

TAFT-HARTLEY ACT: "Watchdog" Committee reports.

FREIGHT RATES: Interim increase granted.

STOCKPILING: Copper-lead-zinc program successful.

now been added to the list of countries. Mineral commodities listed as subject to negotiation with Colombia are emeralds, ores of the platinum metals, and platinum, unmanufactured or in ingots, sponge or scrap.

A supplementary list of commodities subject to negotiation with the countries first listed above includes emery ore (Greece); and metallic arsenic and certain arsenic salts, together with wood impregnating materials containing salts of arsenic, chromium or zinc (Sweden).

Steel Allocations

The voluntary steel allocation plan for the mining machinery manufacturing industry was made effective January 3 when the Secretary of Commerce and the Attorney-General approved the program. Requirement data are being compiled by the Office of Industry Cooperation and preparations are being made to allot 26,400 tons of steel for the month of February. Following a meeting of the Steel Products Advisory Committee on January 12 it was announced that this allocation was raised to 31,785 tons of steel monthly effective March, 1949. The allocation program was also extended until next August.

A public hearing had been held on the program December 7, during which industry spokesmen made suggestions to clarify and broaden the classifications of machinery to be included.

A special subcommittee of the Commerce Department's Steel Products Industry Advisory Committee is expected to work with a bituminous coal mining industry advisory subcommittee on a program for steel for maintenance, repairs and operating supplies for bituminous coal mines. This coal subcommittee includes G. Don Sullivan, Ayrshire Collieries Corp.; Dr. C. J. Potter, Rochester & Pittsburgh Coal Co.; A. L. Lynn, Island Creek Coal Co.; with George F. Campbell, representing Illinois producers, as an alternate to either Potter or Lynn. A similar program covering steel for metal and nonmetallic mines has been prepared for OIC consideration.

Taft-Hartley Act

Acting quickly on the President's call for repeal of the Taft-Hartley Act, Chairman Thomas (Dem., Utah) of the Senate Labor Committee has introduced a repeal bill which would also reinstate the Wagner Act. Senator Thomas had previously stated that he places Taft-Hartley Act revision in fourth place on the Labor Committee's agenda, following Federal aid to education, a science foundation bill and wage-hour revisions, and that he would work for a new law incorporating the best features of both the Taft-Hartley and the Wagner Acts. At that time he stated that it is unfair to label the Taft-Hartley Act a "slave-labor law." Senator Thomas has also introduced a bill which would increase the minimum wage to 75 cents an hour.

In a forthright declaration contained in its final report, the Joint Committee on Labor-Management Relations (created by the Taft-Hartley Act) states that the law is working well, without undue hardship upon labor organizations, employers or employes. The "Watchdog" Committee under former Senator Joe Ball of Minnesota, in rendering its final report, found that the injunction remedy has been rarely used and that the number and disposition of the suits brought by and against labor organizations demonstrate that neither unions nor employers desire to recover money damages from the other, but that the availability of the remedy has encouraged each to act with a deeper sense of responsibility. The Committee emphasized that the elimination of Communists from official posts in both national and local unions is a significant effect of the Act. The report stated that wages have not suffered through operation of any of the law's provisions and that the increase in union membership has been good; further, that the rights of individual workers in job security, in seniority, in the disposal of grievances, and in relationships with employers have been materially strengthened and clarified. Citing many other benefits to the public, to workmen and to management under the Act, the Committee made eight sound recommendations, which include elimination of the requirement for union-shop election as a condition precedent to the right to enter into a legal union-shop contract; perfection of the non-Communist affidavit requirement to make it even more effective; limiting the jurisdiction of NLRB to exclude local businesses whose operations only remotely affect interstate commerce; making clear the right of NLRB in unfair labor practice cases involving mass and coercive picketing, to require the union to reimburse the workmen who have been denied access to their jobs; application of the same restrictions which now apply to secondary boycotts, to strikes which would compel an employer to grant conditions of employment subjecting him to charges of unfair labor practice or criminal liabilities; and minor amendments to clarify the "check-off" provisions, the "free speech" guaranty, and interpretations of the restrictions on union welfare funds.

Publication of the report comes at a most fortunate time to refute unfounded charges which are being made against the Act. Also issued by the Committee is a detailed factual report of the types of welfare funds arrived at through collective bargaining procedures. This includes descriptions of plans in effect for the UMWA, United Furniture Workers, United Automobile Workers, and United Steel Workers.

Freight Rates

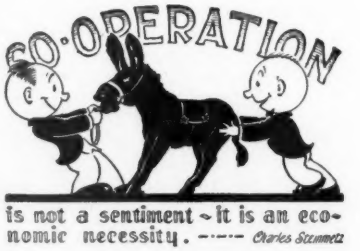
The following freight rate increases were authorized, effective upon five days' notice, by a unanimous decision of the Interstate Commerce Commission rendered December 30: six percent within Eastern and Southern territories and between those territories; five percent within Zone 1 of Western trunk-line territory; four percent within other Western territory; and five percent on interterritorial movements except those between the Eastern and Southern territories. These increases are to be superimposed upon existing rates—an interim increase of eight percent had been sought. Exempted from the increase were line haul rates on iron ore to upper lake ports for transshipment by water and from the Minnesota ranges to Duluth. On coal and coke the increases will range from 14 cents to 25 cents per ton.

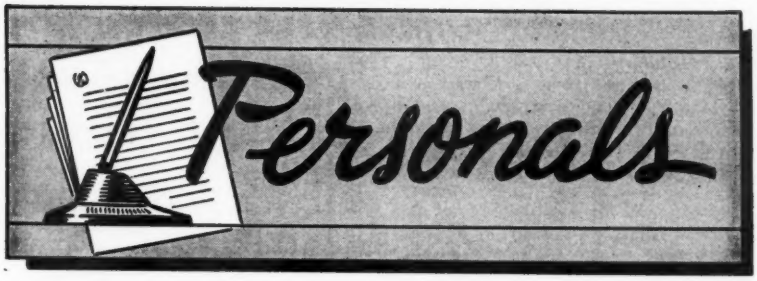
An ICC announcement states that this interim decision will be followed as speedily as possible by hearings at convenient places in each of the four rate territories on the railroads' petition for a 13 percent general rate increase.

Stockpiling

The new voluntary stockpiling program for copper, lead, and zinc is proving successful, according to statements made by Munitions Board officials, who expect to make an early request for a supplementary stockpiling appropriation in the present session of Congress.

Under the Marshall Plan $75,000,000 will be spent for stockpiling of strategic materials secured from foreign countries, according to Evan Just, Chief of the ECA's Strategic Minerals Division. Of this amount $25,000,000 is to be used for long-range investments to increase foreign output of the required materials.





Ernest Wittenau, manager of the New Cornelia Branch, Phelps Dodge Corp., Ajo, Ariz., retired from active duty with the corporation on December 1.

Mr. Wittenau entered the employ of Phelps Dodge in 1915, holding various positions with the company in both Ajo and Morenci. It was under his direction as general superintendent that the huge open-pit mine at Morenci was developed and the concentrating and smelting facilities erected. He was appointed manager of the New Cornelia Branch on January 1, 1946, and since then has directed the completion of the electric haulage system at the Ajo pit, the enlargement of the power plant, an extensive additions to the Ajo townsite and community buildings, as well as the initial work on the erection of a smelter at Ajo. Mr. Wittenau plans to make his home on the Pacific Coast. **Walter C. Lawson** assumed the duties of manager of the New Cornelia Branch, following Mr. Wittenau's retirement. Mr. Lawson entered the employ of Phelps Dodge in 1926 as a mining engineer at Ajo. In 1937 he was trasferred to the Morenci Branch as chief mine engineer, and in 1942 was named mine superintendent. Four years later, in 1946, he was made general superintendent of the Morenci property and continued in that capacity until his return to the New Cornelia Branch at Ajo as general superintendent on September 1, 1948.

C. E. Haney, formerly superintendent, Dorrance colliery, West Virginia Coal & Coke Corp., Stirrat, W. Va., has resigned and now resides at Point Pleasant, W. Va. He will devote his entire time to church work. **W. C. Adkins**, formerly general mine foreman, Mine No. 15, has been promoted to the post of superintendent of the company's Micco No. 3 mine.

Edward P. Scallon, formerly in charge of the land department of Butler Brothers iron mining interest, has established an office as a consulting mining engineer at 137 E. 8th Street, St. Paul, Minn.

D. H. McGeorge has been appointed vice-president and general sales manager of the C. L. Amos Coal Corp.

Thorold Field of Duluth, Minn., and **Orvil R. Whitaker** of Denver, Colo., have been appointed to the Atomic Energy Commission's Advisory Committee on Raw Materials. Other members of this committee are **Donald H. McLaughlin**, president, Homestake Mining Co.; **Everette L. DeGolyer**, petroleum geologist, DeGoyler & McNaughton; **Wilber Judson**, vice-president and director, Texas Gulf Sulphur Co.; **Robert E. McConnell**, McConnell Foundation; **Fred Searls, Jr.**, president, Newmont Mining Corp.; and **Clyde Williams**, director, Battelle Memorial Institute.

Eugene McAuliffe, chairman of the board (retired) of the Union Pacific Coal Co., has been honored as the first recipient of the Erskine Ramsay Medal recently established by the American Institute of Mining and Metallurgical Engineers. The award recognizes distinguished achievement in the production, beneficiation, or utilization of bituminous or anthracite coal. Mr. McAuliffe was cited "for his leadership and initiative in the promotion and achievement of better safety, more efficiency, and improved working conditions in coal mining, which has led to a more healthy coal industry." The medal will be awarded at the annual banquet of the Institute on February 16, 1949, in San Francisco.

C. A. Geatty, director, National Lead Co. and manager of its metal department since 1942, retired at the end of 1948 after almost 50 years of service with the company.

R. E. Henderson has been named general manager of stripping operations for the several companies associated with the Binkley Coal Co., St. Louis, Mo.

Dr. **Wilson H. Elkins**, formerly president of San Angelo Junior College, was recently appointed president of the University of Texas College of Mines and Metallurgy at El Paso. Since the resignation of Dr. **D. M. Wiggins**, who is now president of Texas Tech, Lubbock, Texas, Dean **Eugene M. Thomas** has served as acting president.

Emmett S. Pugh, president Raleigh Smokeless Coal Co. until sold to Blackstone Coal Co. in 1946, has announced the organization effective as of February 1, of a new operating sales company to be known as the Raven Pocahontas Co. The new company will be owned entirely by the producing companies represented, the officers, and employes. At present there are four operating companies: Raven Coals, Inc., The Raven Peerless Co., Raven Red Ash Coal Co. and an affiliate, and the Red Ash Mining Corp., which together are producing approximately 2500 tons per day of mid-volatile coal. The Raven Red Ash Coal Co. is located at Red Ash, Va. and the other properties are in West Virginia.

R. F. Goodwin has been appointed president of the newly-formed subsidiary of the American Smelting & Refining Co., known as the Asarco Exploration Co. of Canada, Ltd.

John E. Bowman, president of Utilities Elkhorn Coal Co., Pikeville, Ky., has announced that **R. A. Hedland**, now general superintendent, has been named general manager effective January 1, 1949. At the same time **J. E. Green** succeeded Mr. Hedland as general superintendent.

Dr. **C. P. Berkey**, Newberry Professor Emeritus of Geology at Columbia University, New York, was awarded the first Kemp Medal for distinguished service in geology. This award was established in honor of the late James F. Kemp, founder of the geology department of the university and a pioneer in engineering geology.

R. F. Duemler, vice-president of the D. L. & W. Coal Co.; **Charles J. Potter**, president, Rochester & Pittsburgh Coal Co.; **George Lamb**, Pittsburgh-Consolidation Coal Co.; **Samuel Weiss**, executive secretary, American Coal & Coke Chemicals Institute; and **Carl Mabley**, vice-president, Island Creek Coal Co., are serving on a committee working with **William Hahman**, director of the Solid Fuels Division of the National Security Resources Board, in preparing an industrial mobilization plan for the coal industry for use in time of national emergency.

A. R. Reiser has been transferred from the National Lead Co.'s titanium operation at MacIntyre, N. Y. to the company's offices at 111 Broadway, New York City, where he occupies the post of assistant chairman of the mining committee under **Gloyd M. Wiles**, chairman of the mining committee.

Henry F. Warden has been elected president of Wm. C. Atwater & Co., American Coal Co., and Mill Creek Coal & Coke Co. **Harry W. Payne** has been promoted to the position of general manager of American Coal Co. and Mill Creek Coal Co. In his new position Mr. Warden succeeds the late **William C. Atwater, Jr. John J. Atwater** was elected vice-president of American Coal Co. and Mill Creek Coal & Coke Co. and **William Beury** was elected treasurer.

Elmer F. Blu, general solicitor for the Oliver Iron Mining Co., the Duluth Missabe & Iron Range Railroad and other subsidiary companies of the United States Steel Corp. in the Duluth area, has retired after 38 years of service. **Donald D. Harries** was elected general solicitor to succeed Mr. Blu.

Charles T. Holland, formerly professor of mining engineering, West Virginia University, is now on the staff of the mining engineering department of the Virginia Polytechnic Institute. He succeeds **L. L. Cothern**, now head of the mining engineering department, Ohio State University.

George H. Ryan is now superintendent for the Castle Mountain Mining Co. in the Austin district of Nevada.

R. J. Burmeister, formerly vice-president of the Raleigh Coal & Coke Co., has been promoted to the post of president. **E. H. Shriver**, formerly assistant general manager, has been named vice-president and general manager.

Lawrence E. Smith, formerly with the US Geological Survey in Utah, is now on the staff of the North Range Mining Co. in Michigan.

John S. Hawley has been appointed assistant to **Alwin F. Franz**, vice-president in charge of operations of the Colorado Fuel & Iron Corp. Mr. Hawley was previously manager of the company's west coast subsidiary, California Wire Cloth.

John L. Kellogg is now assistant superintendent of mines at Jefferson County properties of the American Zinc Co. of Tennessee at Mascot, Tenn. He was formerly associated with U. S. Smelting Refining & Mining Co.

— *Obituaries* —

Horace Edgar Lewis, 67, former chairman of the board and chairman of Jones & Laughlin Steel Corp., died on December 5, in Pittsburgh, Pa.

Since the age of 17, Mr. Lewis had been engaged in the steel industry. In 1906 he left his position as a worker at the Duquesne Works of the Carnegie Steel Co. to enter the employ of Bethlehem Steel Co., where, by 1916, he became executive vice-president. In 1930 he became chairman of the executive committee of the Jeffrey Manufacturing Co. of Columbus, Ohio.

In 1936 he was elected chairman of the board of directors, a director and member of the executive committee of Jones & Laughlin Steel Corp., succeeding the retired G. M. Laughlin, Jr. In 1938 on the resignation of S. E. Hackett, president, Mr. Lewis was elected to that position as well as the board chairmanship and continued in these capacities until February, 1947.

He was a director of the Jeffrey Manufacturing Co., British Jeffrey Diamond, Ltd., and a former director of Kelsey-Hayes Wheel Co. and the Ohio Malleable Iron Co., and an honorary vice-president of the American Iron and Steel Institute.

Andrew M. Hannah, president of the Mackie Clemens Fuel Co. and vice-president of the Clemens Coal Co. in Kansas, died recently after a short illness. Mr. Hannah was nearly all his life in the coal industry as a salesman or an operator, or in various other positions in and around coal mines. He served on various coal boards and committees and was president of the producers' District Board No. 15 under the Coal Act.

Dr. F. G. Cottrell, former director of the U. S. Bureau of Mines and inventor of electrostatic methods for clarifying air and gases and for breaking emulsions of water in petroleum, died on November 16 at Berkeley, Calif.

Howard P. Zeller, 64, died in Greensburg, Pa., on December 10.

Mr. Zeller was well known in Buffalo, N. Y., as vice-president and general manager of the Donner Union Coke Corp., which later became the Donner-Hanna Coke Corp. formed by the Buffalo Union Furnace Co. and the Donner Steel Co. to supply coke for their local plant. In 1930 he resigned to become vice-president of the Jamison Coal & Coke Co. in Greensburg, Pa., a position he held when he died.

After graduating from Ohio State University with a degree in mining engineering in 1905, Mr. Zeller spent a number of years in Mexican coal mines and as mine superintendent for the American Smelting & Refining Co. at Rosita, Mexico. After a short time in the Birmingham, Ala. mining district he became superintendent of mines and beehive coke ovens for Republic Steel Corp. in Pennsylvania. During World War I he was placed in charge of the Toluol Division of the Ordnance Department.

Harry P. Jones, 76, former Pittsburgh coal mine operator and an adviser to the Department of Labor, died recently in Washington, D. C. Mr. Jones for many years operated the firms of Harry P. Jones & Sons and Pittsburgh Buffalo Coal Co.

Philip H. Holdsworth, 67, mining engineer of Seattle, Wash., died late in November. Over the past 50 years he had been engaged on various mining operations in Oregon, as well as British Columbia, Canada, and Alaska.

Robert L. Brainard, 65, long identified with a number of leading Coeur d'Alene mining developments, died recently in Kellogg, Idaho. He had been associated with Metropolitan Mines Corp., the Mineral Mountain Mining Co., Sunshine Consolidated, Silver Bowl Mining Co., the Lookout Mining Co., Nancy Lee Mines, Inc., and the Hypotheek Mining Co. He was prominent in civic affairs and served five terms in the Idaho legislature.

Edward L. Carr, who for many years was assistant to the president of the Bell & Zoller Coal and Mining Co., died recently after a prolonged illness. Mr. Carr was well known in the coal mining industry. In addition to his duties with Bell & Zoller he was for several years chairman of the board of District No. 10.

Walter G. Scott, 57, superintendent of the leaching plant of Inspiration Consolidated Copper Co., died of a heart attack at his home in Inspiration, Ariz., the night of December 4. Mr. Scott was a graduate of the Michigan College of Mines and had been associated with Inspiration Consolidated since 1918. He was instrumental in the development of the present leaching system, working in close association with the late Dr. L. D. Ricketts and the late T. H. O'Brien.

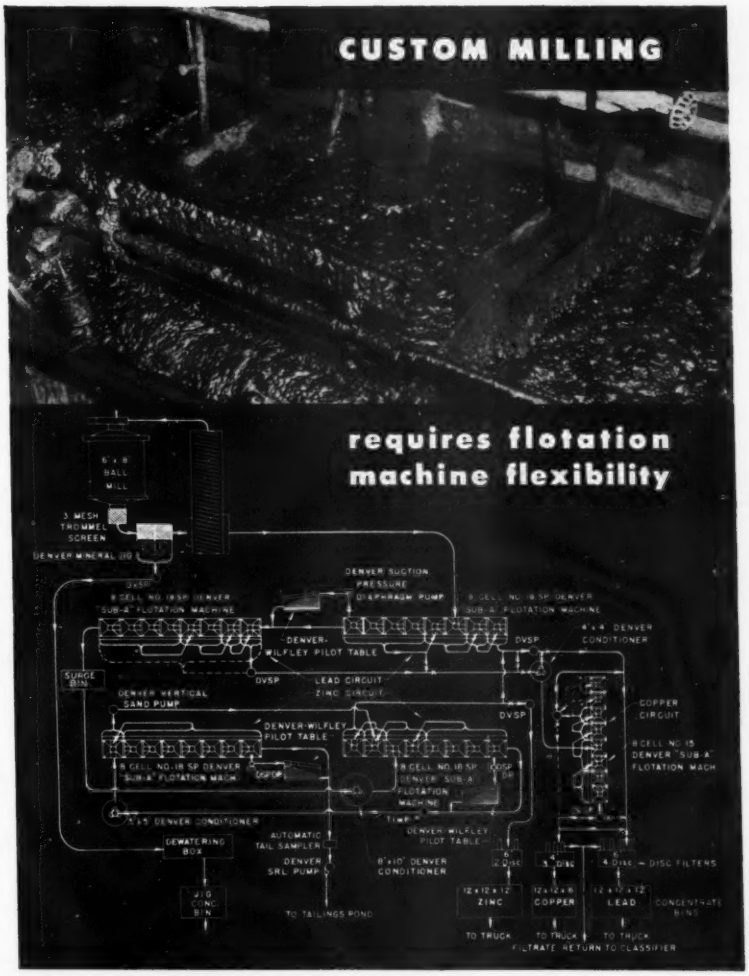
William Harvey Emmons, 71, professor emeritus of geology and mineralogy at the University of Minnesota, died November 5 at his home in Minneapolis. Dr. Emmons served as head of the department as well as director of the Minnesota Geological Survey from 1911 until his retirement in 1944. In addition, he had served as associate editor for the *Journal of Geology*.

Using Denver "Sub-A" Flotation Machines

. . . The American Zinc, Lead and Smelting Company at Ouray, Colorado, serving mines of the San Juan Triangle, are able to economically treat a wide range of complex ores in this 225-ton-per-day Denver Built Custom Mill.

FLOTATION FLEXIBILITY is the key to successful recovery of the many minerals treated. Any Denver "Sub-A" Flotation Cell, singly or in a bank, may be used as a rougher, cleaner, re-cleaner, or even as a conditioner, giving selective high-grade concentrate with low tailing.

COARSE MATERIAL (up to ¼") may be fed from any quadrant, with no short circuiting of pulp. Accurate pulp level is easily maintained. Middlings are recirculated by gravity without use of pumps. Air and/or gas can be admitted under positive control to any Denver "Sub-A" Flotation cell.



PRINCIPAL ORE MINERALS, recovered at this American Zinc Custom Mill by Denver "Sub-A" Flotation, cover a wide range and may vary considerably from hour to hour. These include:

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SPHALERITE
CHALCOPYRITE
MARMATITE (ZnFeS)
ENARGITE (Cu_3AsS_4)
GRAY COPPER (copper, arsenic and antimony sulfides usually containing silver).
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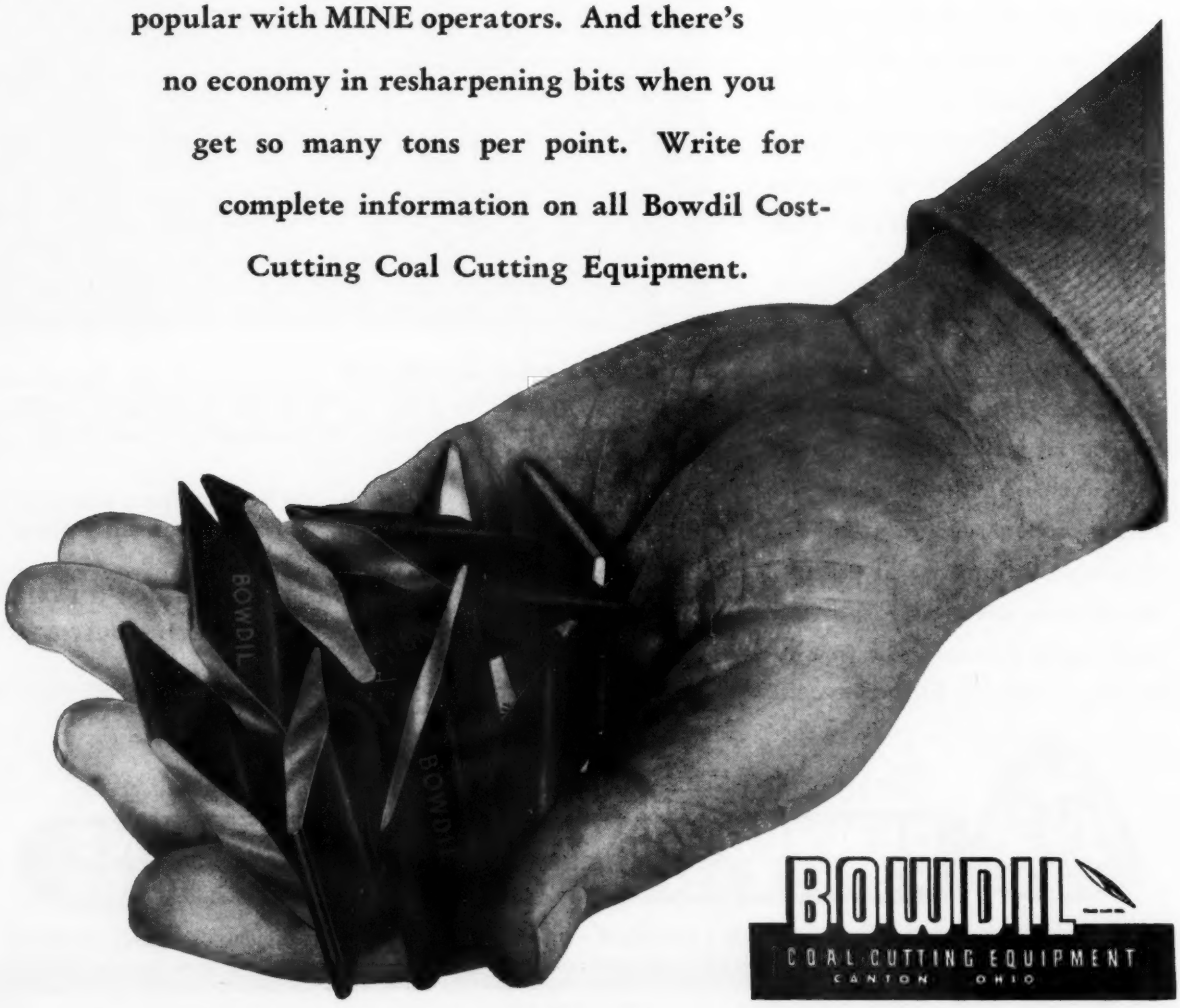

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COAL CUTTING EQUIPMENT
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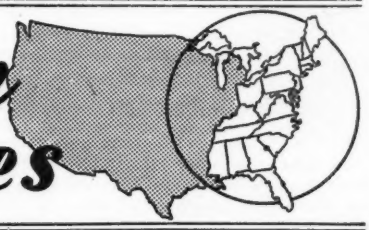

New Jersey Iron Mines Sold

The War Assets Administration recently announced approval of the sale of the pre-Revolutionary War iron mining property at Ringwood, N. J., to the Petroleum Export-Import Corp., New York, N. Y., for $700,000. The entire property was purchased by the Government in 1942 for the purpose of increasing iron ore production for national defense. However, the improvements constructed at the plant were not completed in time for it to get into operation to aid the war effort.

The property consists of about 878 acres with two known iron ore deposits, together with a crushing plant, concentrating mill, equipment, service buildings, utilities, and housing for mine personnel.

A. E. Lynch, president, Petroleum Export-Import Corp., stated that his organization plans to spend a total of $425,000 on the property for plant improvements and mine development.

J & L Registers Claims on Uranium Ore

The Jones & Laughlin Steel Corp., Pittsburgh, Pa., has registered 19 claims in Ontario, Canada, through a subsidiary firm. The claims cover 760 acres of possible uranium ore deposits.

Prospectors of the Jalore Mining Co., Ltd., are reported to have located a vein of pitchblende of high radioactivity. However, the commercial value of the deposit will not be known until the Canadian Government completes tests. The claims are located about 75 miles south of Saulte St. Marie in the Algoma district. The discovery was made in the search for iron ore by prospectors equipped with Geiger counters.

USGS Begins Coal Survey

Speaking before the national fuels conference of the ASME and the AIME, Paul Averitt, USGS, stated that the Survey was embarking on a new and detailed study of the US coal reserves. It is estimated that the Survey will take ten years for completion. The coal reserve figures now in use were assembled in 1928.

Synthetic Fuel Research Makes Progress

Dr. H. H. Storch, chief of the U. S. Bureau of Mines laboratories at Bruceton, Pa., recently stated that new process improvements under development in the synthetic liquid fuels laboratory offer much promise of reducing the cost of the liquid fuel product by efficient conversion of synthesis gas to liquid products. He reported that the internally-cooled method yields about 30 percent more oil than the more widely known fluidized-iron catalyst method with the same volume of synthesis gas. Still greater advantage is said to be offered by the "oil-catalyst slurry" method which produces only one-fourth to one-half as much gas and at the same time delivers a high yield of the more desirable liquid products. The internally-cooled and "oil-catalyst-slurry" converters are being incorporated into the Bureau's new gas synthesis demonstration plant now under construction at Louisiana, Mo.

"A third procedure, which should result in a lower cost of hydrogen as well as of equipment . . .," Dr. Storch said, "consists in passing about twice as much coal through the hydrogenation plant as is hydrogenated. Thus, about one-half of the coal feed is converted to oil and gas and the other half to coke. The latter is burned for steam and power production. In this way, all of the available hydrogen in that half of the coal feed which is converted to coke appears in the oil and gas."

Alcoa Plans Shaft on Zinc Ore Body

Diamond drilling at the Hutson mine in Livingston County, southwest of Salem, Ky., has disclosed a zinc ore body which has been reported to average 28 percent zinc. The property is owned by the Alcoa Mining Co., which acquired the Hutson mine in the purchase of properties of the Eagle Fluorspar Co. Plans call for a 600-ft shaft to develop and mine the ore body. A 100-ton daily capacity flotation plant is planned along with other surface buildings according to Walter S. Skeels, Alcoa works manager.

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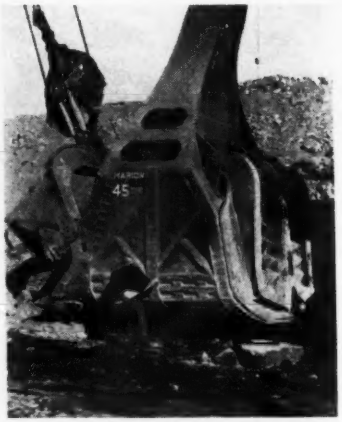
Largest Shovel Made Bigger

After exhaustive tests of the 40-yd dipper used by the Hanna Coal Co., Clairsville, Ohio, a joint experiment has been undertaken by the Marion Power Shovel Co. and the Hanna Coal Co. A 45-cu yd dipper has been installed and it will be tested to learn whether it will prove economical and practical.

The new dipper is almost 100 per-



Largest dipper handles 45 cu yd

cent armor plate steel. It has been redesigned to eliminate excess weight, and fully loaded weighs no more than 35 cu yd dippers of nearly three years ago, fully loaded.

Proof of the new design and construction features employed in the redesigned dipper will be obtained in the course of the next seven to nine months. During this time the ability of the big shovel to take rough duty and give good day by day service with a minimum of repair will be determined.

Gob Fire Research

Establishment of a research fellowship by the Western Pennsylvania Coal Operators Association was recently announced by Dr. E. R. Weidlein, director, Mellon Institute. The program will embrace scientific studies of the causes, prevention, and control of coal-refuse fires.

Dr. William L. Nelson, who will head the fellowship, will investigate the reactions of coal and inorganic sulphides, especially at low temperatures, and will study all factors entering into the problem of the spontaneous combustion of coal-waste, particularly where heaped or piled. Advisory guidance will be available from Dr. George D. Beal, assistant director, Mellon Institute, and of a technical committee constituted of Charles B. Baton, Greensburg-Connellsville Coal and Coke Co.; Henry F. Hebley, Pittsburgh-Consolidation Coal Co.; J. B. Morrow, Pittsburgh Coal Co.; and Harry A. Sutter, executive vice president, Mellon Institute.

Experience already obtained on mine acid control from an Institute fellowship founded in 1946 by the Department of Health of the Commonwealth of Pennsylvania will be available for the new fellowship. Much valuable data has been accumulated concerning the activity of the various types of sulphuric material occurring in coal seams.

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Gas Turbine Test

An oil-fired, gas-turbine, electric locomotive, developed jointly by American Locomotive Co. and General Electric Co., is undergoing track tests at Erie, Pa. These companies are also cooperating with the Bituminous Coal Research, Inc., in development of a coal-burning, gas-turbine engine.

West Virginia Mines Arrange for Coal Sales

Six coal mines in West Virginia of the Pardee and Curtin Lumber Co., have made arrangements with the coal division of Eastern Gas and Fuel Associates who will become their exclusive sales agents. The mines produce approximately 2,000,000 tons annually and are equipped with modern mining and preparation facilities. They include the four Bergoo mines and the Bolair mine in Webster County and the Arthur mine in Harrison County, W. Va.

Power Use Increase Forecast

In a recent speech before the annual convention of the Edison Electric Institute, Gwilym A. Price, president of the Westinghouse Electric Corp., predicted a 72 percent increase in the use of electricity in the United States by 1958. He estimated that in the next ten years the total annual sales of electric power will rise to approximately 374,000,000 kwhr.

A portion of this increased amount of electrical energy will be required to treat low grade iron ores. Mr. Price estimated the power content of a ton of iron ore will be raised from the present figure of 4½ kwhr to 70 kwhr.

Reynolds Metal to Move Plant

The Reynolds Metal Co. has announced that its No. 7 plant will be moved from Louisville, Ky., to Listerhill, Ala., shortly after the first of the year. According to a report from David Reynolds, vice president, Reynolds Metal Co., approximately 185 people now employed at the plant in Kentucky may continue their present jobs at the Alabama plant if they wish. The No. 7 plant is an extensive operation and is being moved to Alabama because of insufficient space in Louisville.

Labrador Iron Prospecting

The Westland Mining Co., Toronto, Canada, has acquired a 500-square-mile prospecting concession in Labrador from the Newfoundland Government. The lease embraces sections of the Labrador coast in the Gilbert Bay area, where government assays have shown values running from 51 to 52 percent iron, 10 percent titanium, with low phosphorus and sulphur. The concession has been optioned by the Westland Mining Co. to a group including Canadian and American steel interests.

Identifying Ores

According to a recent report, a new method of identifying minerals by X-ray analysis of their atomic structures has been developed at Harvard University's Berman Memorial Laboratory. It is said that within a year improved techniques in use at the laboratory will provide the world's most complete reference library of mineral photographs. Identifications which formerly required several hours are said to be accomplished in a matter of a few minutes. Scarce and costly minerals need no longer be subjected to chemical tests which destroy the sample, but can be readily identified by the new method. The project is said to have revealed that many identical minerals have been given different names in various parts of the world.

Chile Copper Awards Contract

The Anaconda Copper Mining Co. recently announced that its subsidiary, Chile Exploration Co., has awarded a contract to Foley Brothers, Inc., Pleasantville, N. Y., for the construction of a plant to treat sulphide copper ore at Chuquicamata, Chile. The project will involve the expenditure of $60,000,000 over a four-year period, according to an official announcement. An overall production of about 540,000,000 lb of copper annually will be enabled upon completion of the new unit.

Long Coal Conveyor

The Tennessee Coal, Iron and Railroad Co., Birmingham, Ala., has recently started operation of a long belt conveyor to move coal from their Concord mine. The belt is designed to carry 1000 tons per hour up a 17 deg slope, with a distance from pulley center to center of 2500 ft. The belt is 42 in. wide, ¾ in. thick and has a ⅛ in. cable core. A total of 900 hp are required to drive the belt. Coal from the Concord mine will be shipped to another washer of the company until a washery plant is built at the Concord mine.

Expanding Scope of Mechanical Coal Mining

Charles A. Owen, president, Imperial Coal Corp., New York, recently stated that approximately 73 large preparation plants are being constructed or rebuilt and that since 1940 the coal industry has invested more than $750,000,000 in improved plants. He added that the industry sees the need for expending $500,000,000 more in the next few years for improved mining and processing facilities.

Extension Classes Draw Large Registration

Extension classes in coal mining, mine equipment maintenance, oil and gas, and fire service operated by the Mining and Industrial Extension Department of West Virginia University have registered a total of 1627 students. Coal mining classes are offered in principal mining communities throughout the state with centers established at Beckley, Bramwell, Madison, Morgantown, Mount Hope, and Richwood.

Undeveloped Coal Tracts Acquired

One of the largest undeveloped blocks of coal land in the vicinity of Clarksburg, W. Va., 3800 acres, was recently acquired by the W. L. Pursglove Coal Co. The tract, known as the Ewing property, is said to contain over 30,000,000 tons of the highest quality Pittsburgh coal.

Together with property already owned or under lease, the Pursglove company has sufficient coal for over 100 years of continuous mining at a rate of 1,000,000 tons per year.

The new property is so located as to afford direct underground connection with the Dola section of the present Mars mine operating in the Chieftain tract. Pursglove Co. already has on order sufficient mining equipment to open at the Dola end a new and

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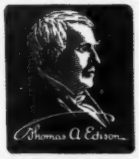

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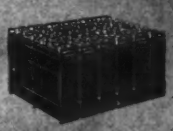

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completely modern mine having a capacity of over 500,000 tons of coal a year, together with a complete tipple for handling it. The new tipple will be of the latest design and will have a capacity to clean and size double the planned output of the mine.

Caledonia Exploration Work Halted

Drilling operations by Sprague and Henwood Co., Scranton, Pa., have been stopped and all drilling equipment has been removed from the old Caledonia iron mine, near Spragueville, N. Y., where the Republic Steel Corp., had been undertaking exploratory work. The crews have been moved to undertake similar work in the St. Regis Falls area and in the vicinity of Benson mines, Star Lake, N. Y.

Threats to Continued Industrial Activities

Harlowe Hardinge, president of the Hardinge Co., Inc., heavy machinery manufacturers, sees the dearth of "risk money" and further spiraling of prices and wages as serious threats to continued industrial activity. Returning from a 11,000-mile trip to many plants in the United States and Canada, Mr. Hardinge made the following observation on the mining and metallurgical outlook: "In the mining field, particularly among the base-metal industries, activity has increased, as a result of improved labor supply and a number of large projects which are contemplated. The small investor is practically out of the market and, as a result of being unable to obtain financial backing, the new small operator is virtually nonexistent. Unless our tax structure is altered to encourage the investment of so-called 'risk capital,' the small mining operations will disappear completely."

TCI Concord Mine Plans Installation of Preparation Equipment

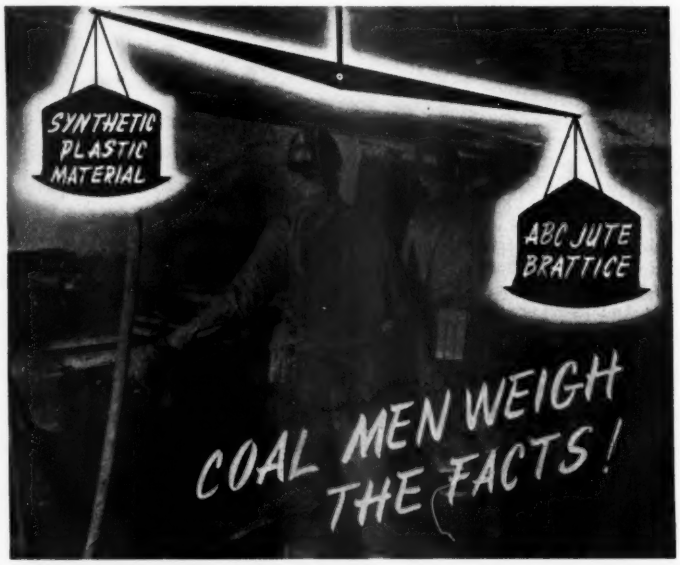
The Concord mine of the Tennessee Coal and Iron Co. in Alabama, which is to be the most modern coal operation in the South is still much in the design stage. It is reported that their coal preparation plant will use the Chance sand cone to process the coarse size coal and tables to wash the fine sizes.

Magnetite Deposit Located

An ore deposit of possible commercial value has been reported discovered in the Meachem Lake area near Duane Center, Franklin County, N. Y. The new area has been described as of strong and uniform magnetic attraction.

Supervisory Staff Changes at West Virginia Coal and Coke Corp.

Thomas H. Childers has been transferred from superintendent of No. 5 Mine to superintendent of No. 15 Mine of the West Virginia Coal & Coke Corp., Omar, W. Va. W. S. Palmer, former superintendent of No. 15 Mine, was transferred to the same position at Mines No. 19 and 19-L. Orville Steele was promoted from general mine foreman of No. 5 mine to mine superintendent. Floyd G. Varney, general night foreman of No. 5 Mine, was promoted to general mine foreman. Wandel Rhodes was promoted from general assistant mine foreman to general night foreman at Mine No. 5. Gene Jordan, section foreman, was promoted to general assistant foreman of No. 5 on the day shift. John Thern has been promoted from motorman at No. 5 Mine to section foreman at the same mine. Virgil Thacker was made a dispatcher at No. 4 Mine. Jake Stewart, formerly of No. 5 Mine, was recently made a foreman supervising a portion of the underground construction work at Mine No. 15. Matthew Dameron was promoted to section foreman of Mine No. 15.



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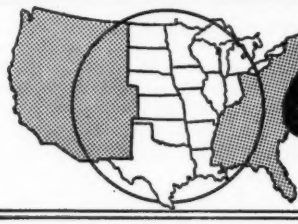

Central States

Winter Stripping Planned

The Inter-State Iron Co. has planned an extensive program of stripping at its Hill-Annex mine at Calumet, Mich., to be undertaken this winter. Approximately 800,000 cu yd of surface material will be removed from an area in the southeastern part of the present pit. Extensive facilities such as roads, power, and water lines will be required for the truck operation. The additional ore provided by extending the pit limit will be of material previously considered too low grade to beneficiate in a washing plant. However, changes in existing plant will be made to enable it to handle the additional tonnage of lower grade material.

Old Smelter Resumes Operation

On October 15 the first copper of the Quincy Mining Co.'s smelter at Ripley, Mich., was produced after many years of idleness. In addition to smelting the product of the company's reclamation plant at Mason, some custom work may be taken on.

Mountain Iron Washing Plant Runs at Peak Capacity

The new washing plant of the Mountain Iron mine of the Oliver Iron Mining Co. located on the Mesabi Range in Minnesota has been in successful operation for the latter half of the 1948 season. The new plant, designed for normal capacity of 400 tons crude ore per hr, has been operating at an average rate of about 500 tons of ore per hr. Studies are underway of suitable methods and equipment for treating tailings, and plans contemplate installation of proper equipment during 1949.

Conglomerate Sands May Serve as Abrasive

In cooperation with Poor and Co., Chicago, Ill., the Calumet and Hecla Consolidated Copper Co. has undertaken experiments to determine the suitability of finely ground conglomerate sands as an abrasive in buffing bars, deburring compounds, and liquid abrasives. Small lots of sand have already been processed at the laboratory of Poor and Co. at Waukegan, Ill. About 150 tons per month of finely-ground, dried, conglomerate sands will be shipped to Waukegan for blending with other sands and ingredients. Tests will be arranged for determining the suitability of the products on a commercial basis. If the tests prove successful, consideration will be given to equipping a plant at Lake Linden for production of the material on a commercial basis.

Holman-Cliffs Expands Washing Plant

An expansion program at its Holman-Cliffs iron mine at Taconite, Minn., is now under way by the Mesaba-Cliffs Mining Co. The present washing plant is being extended to house a high density plant. The Western-Knapp Engineering Co. is making good progress in erecting the new addition which will increase the capacity of the existing plant.

Illinois Operators Elect Officers

At the 19th annual meeting of the Illinois Coal Operators Association George F. Campbell was elected president; J. Roy Browning, vice-president and labor commissioner; Fred S. Wilkey, secretary; and Thurlow G. Essington, general counsel. C. W. Peterson was elected treasurer. The executive board of the association consists of the following members: J. Roy Browning, D. W. Buchanan, D. H. Devonald, George B. Harrington, Hubert E. Howard, E. R. Keeler, T. C. Mullins, T. J. Thomas, A. H. Truax, and William P. Young.

Cleveland-Cliffs Establishes Metallurgical Fellowship

The Cleveland-Cliffs Iron Co., Ishpeming, Mich., has established a graduate fellowship in metallurgical engineering at the Michigan College of Mining and Technology in Houghton. The fellowship becomes effective at the beginning of the 1949 fall term. The award will be made on a competi-

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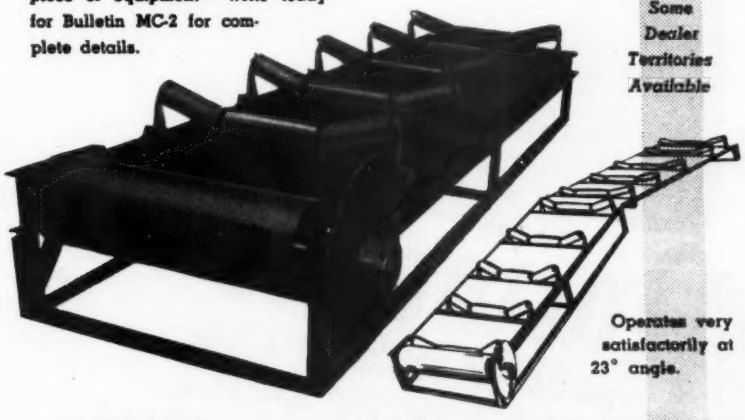

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tive basis limited to those students who have received a bachelor of science degree in metallurgical engineering or in mineral dressing from an approved college or university in the United States or Canada.

Lake Superior Ore Reserves Estimated

Dr. Grover C. Dillman, president of the Michigan College of Mining and Technology, Houghton, Mich., states that it is "reasonable to assume that the Lake Superior ranges have a future life approximating 45 years."

Dr. Dillman pointed out the technological advances in the arts of mining and mineral dressing, and in blast furnace practice, and changing economic conditions will greatly enhance the iron ore reserves of the Lake Superior Ranges.

In recent years 20 percent or more of the iron shipments have been concentrates made by washing and other methods of gravity concentration in which 1½ to 2½ tons of iron formation have furnished one ton of shipping ores. These processes are now so well established that those parts of the iron formation to which they can be applied are listed as reserves."

Dr. Dillman pointed out that, if the St. Lawrence Waterway is built, potential sources of supply of ore for the furnaces now dependent on the Lake Superior district would be materially increased. These sources of supply could equally serve furnaces situated on the Atlantic Seaboard. He outlined these sources as Labrador, Newfoundland, Cuba, Venezuela, Brazil and Chile, Sweden and Africa.

Oliver Iron Mining Co. Sets Peace Time Record

During 1948 the Oliver Iron Mining Co. produced 36,526,000 tons of ore, the greatest peacetime output in its 56-year history. A total of 25 mines located between Coleraine and Biwabik on the Mesabi range, at Ely and Soudan on the Vermilion range, in Minnesota; and at Ironwood, Mich., on the Gogebic range combined to produce the ore. Included in the total of ore producing mines are seven underground properties.

The new Sherman mine was opened in 1948 and made its first shipment in August. Development work and mining continued at the nearby Monroe mine and plans were announced for a $3,500,000 improvement program to include maintenance shops and employe buildings at both the Sherman and Monroe mines.

In the program to conserve direct shipping ores, construction was begun on a new iron ore beneficiating plant at Mountain Iron, Minn. Along with its big Trout Lake concentrator, this new plant, placed in operation last summer, assisted in enabling the company to set its production record for iron ore concentrates.

On the eastern Mesabi range, dewatering operations begun at the Gilbert mine are expected to enable the mine to go into production in 1949.

During the winter a heavy program on equipment repair work and stripping operations will stabilize employment. Already under way is a program for the removal of 28,000,000 cu yd of overburden in order to get mines ready for 1949 production.

High Auto Output Requires More Coal

In the week ending December 17, production of cars and trucks in the United States and Canada reached a new post-war high with 125,452 units produced. Each time a vehicle is completed, it is significant that along the manufacturing route some 10,000 to 12,000 lb of coal have been used. This fact makes the automotive industry one of coal's best customers. For the production of an estimated 4,600,000 passenger vehicles in 1949, plus trucks, the 1949 coal demand for the automotive industry may approximate 35,000,000 tons.

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Coal Research Fund Under Consideration

Approval of a $515,000 appropriation for building and operating a plant to make smokeless coal experiments using Illinois coal is under consideration by the state budgetary committee in Springfield, Ill.

Plans for a pilot plant have been completed by A. D. Singh Co. of Chicago and have been approved. According to Dr. Singh, all Illinois coal can be desulphurized to meet smoke abatement requirements and the program fits in well with the needs of synthetic fuel programs as the making of smokeless coal gives off valuable by-products.

Changes Speed Shaft-Sinking

At the Mather "B" shaft of Cleveland-Cliffs Iron Co. at Negaunee, Mich., on the Marquette Range, excellent progress has been made in sinking. The footage advance during October was 170 ft. Adoption of tungsten-carbide insert bits reduced the drilling cycle from 4½ to 1½ hours. The use of a ⅝cu yd clam-shell bucket for shaft mucking has added considerably to the speed obtained in mucking the shaft. The hydraulic pumps which power the shovel are located 40 ft above the bottom of the shaft.

Cleaning up the corners of the shaft has been accelerated by loading the bucket in one corner and dumping it in a tray located near the center and letting the bucket swing under its own momentum to the opposite corner for another load. The swings back and forth have considerably reduced the manual effort previously required. When hand mucking was used in the Mather "B" shaft, 16 men were used but with use of the clam-shell only six men are needed.

Lake Superior Mines Safety Council Meets

At a meeting of the Lake Superior Mines Safety Council on December 8, 1948, a paper "Safety in Sub-Level Caving," by R. P. Bremner, was presented. Hugo Korpinen, operation engineer, The Cleveland-Cliffs Iron Co., discussed "Blasting with High Velocity Charges." William R. Atkins, superintendent, The Cleveland-Cliffs Iron Co., spoke on "Investigating Accidents." T. U. Luthanen, safety inspector, Oliver Iron Mining Co., Ely, Minn., addressed the meeting on "The Foreman's Role in Maintaining an Accident-Free Record at the Soudan Mine." A round table discussion was held on "Forepoling Methods in Use on the Gogebic Range."

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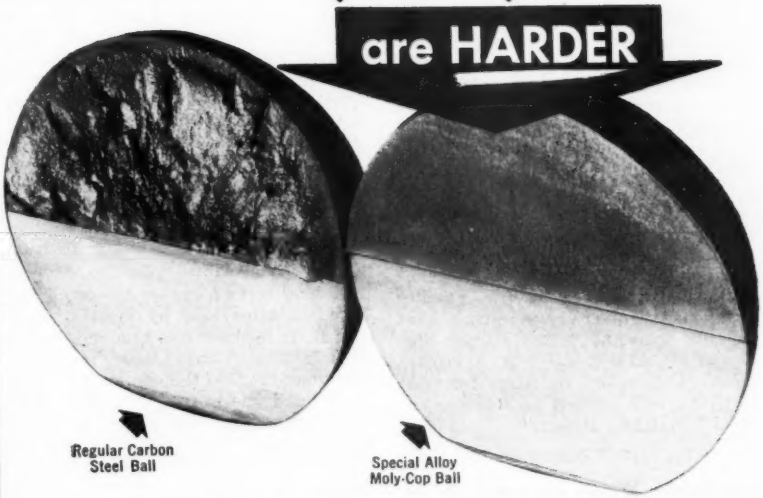

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Mineral Industry Institute Plans Meeting

The 22nd annual Mineral Industry Institute, to be held on the University of Washington campus on Thursday, January 20, has scheduled prominent industrialists and leaders in the field of fuels and industrial power to speak on the one-day program. E. H. Whitney, Gladding, McBean and Co., will speak on fuel problems of the ceramic industry. The electrical power problem will be discussed by Frank McLaughlin, president, Puget Sound Power & Light Co. N. Henry Gellert, president, Seattle Gas Co. will present a paper entitled "The Magic Flame." Following a dinner at the Faculty Club on the University campus, a joint meeting with the North Pacific Section of the AIME, Ralph A. Sherman, assistant director, Battelle Memorial Institute, will present an address entitled "Coal and Power."

New Mexico Miners Meet in Santa Fe

The 1949 convention of the New Mexico Miners & Prospectors Association will take place in Santa Fe, N. M., February 10, 11, and 12 with headquarters at the La Fonda Hotel. Technical papers on petroleum, potash, and future ore reserves of New Mexico, in addition to other subjects, will be prepared and presented by top-flight men in their respective fields. James Boyd, director, U. S. Bureau of Mines, will speak at the annual banquet.

Terrible-Dunderberg Reopens

After being closed since 1921 the Terrible-Dunderberg group of mines at Silver Plume, Colo., has been reopened. Early in 1945 plans were made to reopen the Union tunnel and unwater the Silver Ore shaft of the Terrible Mine. In the course of unwatering, approximately 12,000,000 gallons of water were pumped. Although the workings were badly caved, sufficient samples could be taken and geologic studies made to indicate that the Terrible-Dunderberg had considerable merit.

A sub-lease was given to Gold Mines Consolidated, Inc., to operate the property and Walter E. Scott, Jr. of Central City was retained as consulting engineer to direct the work of rehabilitation and get the mine into production. To put the mine in operating condition 2600 ft of drifts, 450 ft of shaft, and 350 ft of raise were retimbered. A large portion of these openings had to be spiled. Shaft ore pockets and an ore bin at collar of shaft had to be rebuilt. Approximately $166,000 was spent to put the mine into production. The gross metal production for October 1948 was approximately $37,000, with a net return of over $15,000. In metals the October production was 16.4 oz gold, 8530 oz silver, 909 lb copper, 78,658 lb lead, and 69,201 lb zinc.

A long term lease on the adjoining Mendota mine held by Messrs. Scott and H. L. Tedrow has been sub-leased to Gold Mines Consolidated, Inc. This combination gives the company a block of ground more than one-half mile wide and nearly two miles long, containing many early day productive veins which have not been worked for years.

K. M. Ohlander of Georgetown is president and general manager of the company, Andrew C. Holm is mine superintendent, and W. C. Calkins is master mechanic. Walter E. Scott, Jr. continues as consulting engineer for both properties.

High Grade Shipped by Golconda

The Golconda Mining Co., in the Coeur d'Alene district, Idaho, has shipped 100 tons of silver-lead concentrates from a drift development on the Golconda vein that has produced gross smelter returns of $34,049. The lot of ore averaged 58 oz silver and 72 percent lead per ton, and produced 5800 oz of silver and 144,000 lb of lead. A large portion of the vein from which the rich ore came is high grade milling ore. The company is now milling a second shipment. No stoping has been attempted, although there is 1000 ft of probable ore overhead. The main object is to discover the length of the ore-shoot. About 400 ft of it will be on Golconda ground, after which the strike of the vein enters the Square Deal Mining Co.'s property, in which Golconda holds a 50-50 production interest in addition to shares in the Square Deal Co. which gives Golconda a three-fourths interest in possible production from this area. Golconda is equipped with a 300-ton modern milling plant, which has been utilized for several years as a custom mill.

Swansea Operations Increase

Swansea Mines, Inc., operating a mill at the Silver Bell mine, 12 miles from Lincoln, Mont., plans to increase operations to full time from the present two shifts a day in the near future. The mill is producing high grade concentrates of gold, silver, copper, and lead. Mill feed has been largely from development work, but two stopes are now ready for operation. Nearly vertical veins, with good granite walls, permit the use of shrinkage methods of mining. The enlarged and remodeled mill is electrically operated. a 23,000-v transmission line having been installed last year, connecting with facilities of the Montana Power Co. When the original mill was installed in 1942, oxidized ore yielded principal values in gold and silver, but with depth more and more sulphide ore is being mined which has resulted in increased copper and lead recovery and simplification of flotation recovery. Concentrates are shipped to the A. S. & R. Co.'s smelter in East Helena. C. L. Hewitt is president and in charge of operations, and Oscar Fullner is superintendent.

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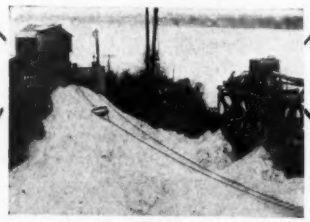

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Colorado Mining Association Meets in Denver

Small mining enterprises and their place in the economy of the nation will be the theme of the 52nd annual meeting of the Colorado Mining Association in Denver, January 31-February 1-2, 1949.

Along with other special features to take place at the 1949 meeting will be the collection of gold to regild the dome of the capitol building of Colorado. Some 60 oz are required to do this job. The Gold and Silver Banquet will be a golden jubilee and the Sowbelly Dinner will carry on the famous western traditions. Hotel headquarters are the Shirley-Savoy, the Brown Palace, and Cosmopolitan Hotels.

Kelley Shaft Makes Progress

The huge Kelley shaft being sunk as the main access to the Greater Butte Project of the Anaconda Copper Mining Co. was recently reported by Chester H. Steele, mines geologist, as being driven down 207 ft. The 9 by 38-ft shaft will be lined with concrete slabs and will permit the lowering of mine-sized electric locomotives in the cage compartment. Two hoisting compartments will handle an anticipated 5000 tons a day in 1951, which will later be increased to 15,000 tons a day. The main hoist will be powered with 2500 hp and will move at a speed of 2250 fpm.

Operations Stopped at Fad Shaft

Operations at the Fad shaft of the Eureka Corp., Ltd., Eureka, Nev., have been halted after an increased flow of water was encountered. Preliminary estimates indicate more than $8,000,000 probably will be required to unwater the shaft and open ore zones. First encountered in November, for a time the water level was held at 1850 ft, after having previously been lowered to 2250 ft. The operating force had been halved pending appraisal of the situation and installation of equipment calculated to handle 9000 to 10,000 gpm. However, further flooding made it necessary to halt pumping operations in order to conserve funds pending results of studies being made to determine the best plan of procedure. The general manager had reported that the increased water flow was much greater than the pumping capacity of the plant, and in addition the flow was accompanied by mud and disintegrated rock material from a fissure or fault which filled the shaft to a point 90 ft below the sixth level. Eureka directors are consulting mining experts to determine the best method of getting the mine back into operation. When a report has been submitted, a shareholders meeting will be called to deal with the matter. The Fad shaft was sunk to 2415 ft in 1948 and cross cutting had started toward an ore body to the west. A water flow of 2000 gpm was encountered 125 ft from the shaft, which added to the 1600 gpm being pumped at that time necessitated the installation of additional pumping capacity to handle it. Recent reports have been to the effect that the mine was pumping 6000 gpm before the most recent flooding.

New Park Initiates Housing Plan

New Park Mining Co. in the Park City district of Utah has initiated a housing plan to provide homes for company miners and their families. Tentative plans for the new town indicate that housing facilities will be constructed approximately six miles north of Heber, Utah, and in easy access to the New Park property.

An architect has been employed and is laying out a model village including such features as an employes' club and a golf course. The employes will own their own homes. Some 25 homes are expected to be included in the initial program to provide good permanent housing for the employes of the company.

Arizona Film Features Mining

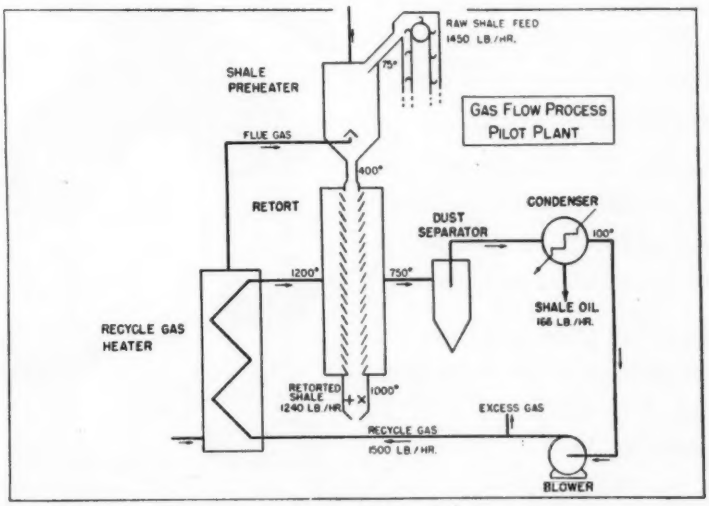
An industrial film on Arizona, financed by Phelps Dodge Corp., has been completed and will be released soon for public distribution. The picture shows the spectacular beauty of Arizona's mountains and desert and combines with it the story of the industrial development in mining and agriculture. In announcing the film's completion, Morton F. Leopold, director of the Motion Picture Bureau of the Bureau of Mines and under whose supervision the film was produced, stated that more than 100 prints of the film have been ordered for distribution to various public film depositories.

Gas-Flow Retort Test Successful

INITIAL test runs in a new continuous type retort at Rifle, Colo., using a gas-flow retort with a designed capacity of 25 tons of shale a day have proven successful. Recoveries have exceeded the Fischer assay value of the 30 gallon per ton of shale used. In reporting on the new unit, the Bureau of Mines states that incoming raw shale is heated by a transverse flow of gas derived from the process. The shale, crushed to small size, passes continuously down between two sets of louvers. Hot gases are driven across the downward-moving bed to retort the shale and the spent shale is withdrawn continuously from the bottom and disposed of as waste.

If exhaustive tests prove that the pilot plant is efficient, the process will offer good prospects for larger developments. Among the advantages indicated are the capacity of the unit to handle large tonnages of shale at a moderate construction outlay and sufficient quantities of high calorific gases can be produced for other plant use.

The Bureau of Mines has supplied crushed oil shale to both the Standard Oil Development Co. and the Union Oil Co. of California for experimental processing in two continuous retort pilot plants of their design.



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Northwest Mining Association Meets

The 54th annual convention of the Northwest Mining Association, held in Spokane, Wash., December 3-4, resulted in the reelection of the following officers for another year: Rowland King, president; J. E. Berg, vice-president; E. R. Barnes, treasurer; and Roger O. Oscarson, secretary. Trustees elected for 3-year terms were Wallace Woolf, superintendent of the Sullivan Electrolytic Zinc Smelter; John J. Curzon, manager of the Howe Sound Co.'s Chelan, Wash., division; Robert Ford; and W. R. Greene.

Delegates from Washington, Oregon, Idaho, and Montana, as well as Alaska, British Columbia, and the Yukon, participated in the various activities.

That Washington State 1948 mineral production will set a new record was predicted by Sheldon L. Glover, supervisor of the Washington Division of Mines and Geology. Speaking for Oregon's mining activities and summarizing the state's activities, F. W. Libbey, director of the Oregon Department of Geology and Mineral Resources, stated that Oregon's metal mining remained static in 1948 although nonmetals continued in strong demand.

Full cooperation of the entire mining industry, labor, and government was urged by C. Girard Davidson, Assistant Secretary of the Interior, in order to fill the vast demands of the nation for minerals.

Nabob Begins Milling Operations

The Nabob Mining Co. in the Pine Creek district, Idaho, has started milling operations on ore from the Crystalite vein on its recently completed lower tunnel level. This ore is high in lead. Concentrates will run around 69 percent lead and 12 oz silver. Eight other vein fissures have been crossed on which drifting will be done shortly, especially on the Sidney-Denver vein, which was cut by the deep tunnel 1000 ft westerly from the area in which Nabob had blocked out a large tonnage of ore on upper levels.

Belle Eldridge Extends Activities

With the discovery of an 18-ft vein of gold ore reported to average $30 per ton, the Belle Eldridge Gold Mines, Inc., Deadwood, S. D., is planning an extension of activities. Systematic core drilling has been carried out under the direction of L. T. Leach, company consulting engineer. Assays have shown good values from a large area and the necessary work to increase the mill capacity from 50 to 100 tons per day is under way.

Montana Mineral Resource Inventory

A second edition of the preliminary inventory of Montana's mineral resources, first published in 1945 by the Bureau of Mines and Geology of the Montana School of Mines, is now available. Like the first edition, this new edition is presented by Francis A. Thomson, director of the Bureau and president of the Montana School of Mines. Revision has been made by U. M. Sahinen of the Bureau staff.

Cooperating in finishing the rough draft of the inventory were G. N. Bennett of the US Bureau of Mines and his staff, F. C. Armstrong, of the US Geological Survey, and Messrs. M. H. Gidel, Carl J. Trauerman, and A. V. Gillies.

The new inventory includes a brief discussion, with the location so far as known to date, of some 64 minerals including metals, nonmetallics, oil shale, and coal.

Uranium Sought in Black Hills

Dozens of prospectors have gone to the Black Hills in South Dakota in search of uranium ore. The South Dakota School of Mines reports prospectors are searching the hills for radioactive ore, and the school has been beset by prospectors seeking information regarding it. Some traces of pitchblende and radioactive pegmatites have been found, but to date none has proved of high enough content to be profitable.

Idaho Mine Ships Thorium Ore

The first domestic shipment of ore containing thorium was shipped to the Lindsay Light & Chemical Co., of Chicago, for processing, from Rare Earths, Inc., McCall, Idaho. The 40-ton shipment of monazite sand contained five to six percent thorium. The rest of the sand is made up of rare earth elements useful in modern industry.

Block Leasing Scheduled in Arizona Mine

J. E. Dietrich and associates of Santa Barbara, Calif., are reopening the old Castle Dome lead properties in Yuma County, Ariz. As the first step in their program, they are getting the 250-ton mill in shape and when it is ready to handle ore they propose to lease blocks of ground to various operators, then treat the ore from all leases in the common plant.

The Castle Dome district, organized in 1863, is credited with an estimated production of $1,000,000, most of which came from early-day operations when the ore was mined without machinery of any kind. At that time the ore was hand-sorted, sacked, and sent by teams to the Castle Dome landing on the Colorado River, then by clipper ships to the Selby Smelter at San Francisco. Lead accounted for more than 50 percent of the value of the district's output.

Wilfley Mine in Production

A zinc deposit with a production potential has been drilled by the U. S. Bureau of Mines in the 62-year-old Wilfley mine, near Kokomo, Colo., between Dillon and Leadville. J. J. Walsh, president of the Wilfley Leasing & Mining Co., said preliminary production is under way from a 9 ft vein about 300 ft below the lower tunnel of the mine.

The mine was opened in 1886 by A. R. Wilfley when he drove a 1500-ft tunnel. The ore produced contained gold, silver, zinc and lead, but at that time the zinc couldn't be recovered. When acquired by the present owners the main tunnel and other workings had caved and the mill was obsolete. By 1941, a crew had cleaned out and timbered 3000 ft of the tunnel and other workings and had developed a tonnage of lead-zinc ore.

High Cost—Low Price Finish Gold Mine

Plans for the complete liquidation of the surface plant and underground equipment at the Goldroad mine, near Kingman, Ariz., has been announced by United States Smelting Refining & Mining Co. L. H. Duriez, manager, issued the following statement:

"The United States Smelting Refining & Mining Co. has decided to liquidate and remove the remaining equipment underground and its mill and surface plant at its Goldroad mine due to the high cost of maintaining the property and high taxes. On account of the remoteness of obtaining relief from the high cost of labor, materials, and the gold price, it is impossible to mine the present low-grade ores economically. As the greater part of this equipment will no doubt become obsolete before operations can be resumed, it will be disposed of."

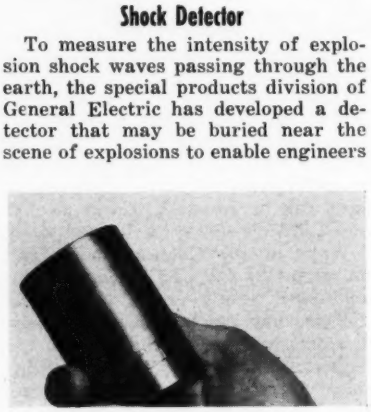
Work at the Goldroad mine was halted in the fall of 1942, due to the gold-mine closing order, L-208, and the property has been maintained on a watchman basis in the interim. It has been controlled by U. S. Smelting since 1911 and has a production record close to $10,000,000, principally in gold.

No, no, Peabody! Lewis is not the dictator of the United States. Let me explain again."

Manufacturers Forum

Shock Detector

To measure the intensity of explosion shock waves passing through the earth, the special products division of General Electric has developed a detector that may be buried near the scene of explosions to enable engineers



to determine the underground velocity and acceleration of shock waves caused. The instrument, which is about the size of a small tin can, is said to register shocks up to 1500 times the force of gravity, and as many as 10,000 impulses per second.

Small crystals contained in the acceleration detector generate a voltage when under stress. The signals from the crystals are carried through cable to amplifiers and delicate recorders above ground. The acceleration detectors are custom built to suit the needs of the user.

Lightweight Mine Jacks

Two new mine jacks have recently been announced by the Star Jack Co., Chicago. The new jacks, made of aluminum alloy, are lighter in weight than similar jacks constructed of malleable iron and steel. A spinning hand wheel instead of conventional wing nuts and slide handles is said to cut down the setting-up time for the new jacks. A half turn of the wheel disengages the nut from the retainer locking lug, and permits raising and lowering of the screw.

The model MSP has a screw travel of 15 in. with a 16-ton capacity and the MRT model has a screw travel of 36 in. with an 8-ton capacity. The jacks can be furnished in various heights.

Rust-freezing and corrosion is said to be eliminated by use of a cadmium-plated screw operating in an aluminum alloy, heat-treated nut.

Repair Cement Resists Corrosion

A thermosetting resin called Carbo-Fix, produced by the Carboline Co. of St. Louis, has been developed to resist acids, solvents, and alkalies or mixtures of them. The resin which adheres to metal and glass has been successfully used in filling pits and holes in pumps on acid service.

Double-Conical Crusher

The Latture Crusher Division of Diesel Pump & Electric Mfg. Co., Los Angeles, has announced a double-conical crusher designed to fracture material by multiple transverse impact loading. The design of the mating crushing rotors is said to provide positive feed and discharge without clogging, even when handling wet or sticky material. To afford protection from uncrushable material, a spring actuated linkage relieves pressure when excessive loading occurs.

Joy Buys Canadian Firm

The Joy Mfg. Co. recently purchased Whitehall Machine & Tools, Ltd., of Galt, Ontario. A substantial portion of the Canadian company's business consists of the sale of mining equipment.

Automatic Line Oiler

A new automatic line oiler produced by Gardner-Denver Co., Quincy, Ill., is designed to protect against running rock drills or other compressed

air equipment without adequate lubrication. The new device is built to shut off the line air automatically when all the oil in the reservoir is

Supervisor's Car Now In Production

The Trike, announced in June 1948 MINING CONGRESS JOURNAL, is now in production by the Baker Industrial Truck Division of the Baker-Raulang Co. The unit is designed to carry loads up to 500 lb which may consist of one man and supply parts or tools. The over-all dimensions of the vehicle are 36 in. in width, 6 in. ground clearance, and 22 in. over-all height with the man in prone position.

Battery-powered personnel vehicle operates in low coal

used. When in operation the flow of oil is metered so that pneumatic equipment using from 25 to 500 cu ft of air per minute can be efficiently lubricated. It is not necessary to shut off the line air or stop the machine when refilling the reservoir.

Western Machinery Acquires Fagergren Flotation Machine

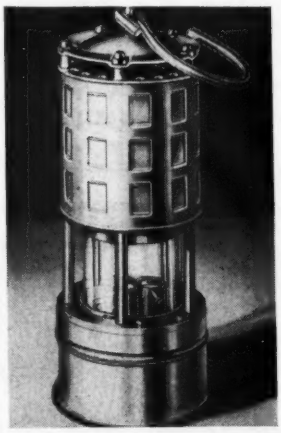
The Western Machinery Co. has recently acquired exclusive sales and manufacturing rights to the Fagergren flotation machine. The full requirements of existing installation including prompt delivery of replacement parts will be handled by the Western Machinery organization and the manufacture of the machine will be done in their Sacramento plant. The Fagergren flotation machine was previously handled by the American Cyanamid Co.

Protective Coating

The Wilbur & Williams Co., Boston, Mass., reports development of a combination chemical pretreatment and primer for metal which is said to eliminate the necessity of having to remove all rust or to have a surface perfectly dry before painting. A vinyl base primer can be applied over clean or rusted metal to provide a hard, paintable foundation for other types of paints.

Lightweight Flame Safety Lamp

A compact, lightweight flame safety lamp, the "National" Model Koehler, is reported to embody all the time-proven safety and operating features of the standard Koehler—plus many



new engineering ideas. It is said to be the lightest, smallest safety lamp produced that is approved by the U. S. Bureau of Mines. The model weighs only 1-lb 12⅛ oz and measures 8¾ in. from the base to the top of the dome. The lamp is made of durable aluminum alloys to withstand severe operating conditions. National Mine Service Co., with divisions located at Beckley and Logan, W. Va.; Forty Fort, Pa.; and Jenkin and Madisonville, Ky., are the sole distributors of the "National" Model Koehler Flame Safety Lamp.

Diesel Mine Trammer

A Diesel-powered mine locomotive recently presented to the Colorado School of Mines is so designed as to be usable in the 5 by 7 drift usually standard in many metal mines. The height of the Diesel locomotive is well under 4 ft and the width is 33 in. A two and one-half ton locomotive will run on an 18 in. gauge track. The unit, designed by Joseph P. Ruth, was a joint presentation of more than a dozen Denver, Colo., firms

Heat Resistant Filter Cloth

Filtration Engineers, Inc., Newark 4, N. J., have announced new filter fabrics of heat-resistant Vinyon-N which are recommended for use where hot acids are involved. The new filter cloth is said to possess superior resistance to alkalies and bacterial action.

— *Announcements* —

The W. P. & R. S. Mars Co., Duluth Minn., has been appointed distributor of earth drills manufactured by the **Hardsocg** division of the **Cardox Corp.**

* * *

James W. Moran has been elected president of the **Baker-Raulang Co.**, to succeed **E. J. Bartlett**, who became president emeritus and continues as a director.

* * *

The Atlas Powder Co. recently announced that **D. J. Carroll Copps**, previously manager of the company's Chicago district explosives sales, has been appointed manager of Joplin, Mo., district sales, succeeding **R. E. Caskey**, who has taken over general advisory duties on explosives sales in the midwestern area. **John F. Flippo**, formerly assistant manager of the Chicago district, succeeds Mr. Copps as manager of that district.

* * *

Bernard H. McGuiness has been appointed vice-president of the Robins Conveyors Division of **Hewitt-Robbins Incorporated.**

* * *

Dan F. Beaton has joined the staff of **Western Machinery Co.** as sales engineer with headquarters in the Salt Lake City office.

* * *

W. E. Madden has been appointed vice-president of the **George Haiss Mfg. Co., Inc.**, subsidiary corporation of the **Pettibone Mulliken Corp.**, Chicago.

* * *

David A. Pollock has been appointed to the sales-engineering staff of **Eastern Car & Construction Co.** with headquarters at Easton, Pa.

* * *

R. L. Loofbourow is now manager of the mining division of **R. J. Longyear Co.**, Minneapolis, Minn.

* * *

R. R. Schultz has been promoted from assistant to sales manager of the crusher and process machinery division of the **Nordberg Manufacturing Co.**

* * *

Carl W. Volz has been elected a vice president of **Electro Metallurgical Co.**, a unit of Union Carbide and Carbon Corp.

— Index To Advertisers —

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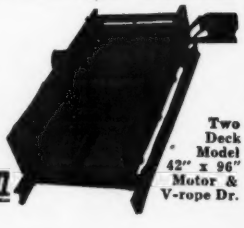

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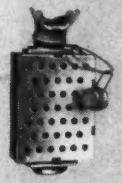
The famous M.S.A. McCaa two-hour apparatus, recognized standard of the mining industry, supplies complete respiratory protection to the wearer in unbreathable atmospheres for a minimum of two hours, under hard physical exertion. Approved by the U. S. Bureau of Mines, the Two-Hour Apparatus employs a high-pressure oxygen cylinder, and a regenerator which purifies expired breath by removing the carbon dioxide, returning the oxygen content to the circulating system. This Apparatus is the cornerstone of mining protection and rescue programs. Write for Bulletin BB-3.



M·S·A SELF-RESCUER

A miniature gas mask, U. S. Bureau of Mines-approved, belt carried, hermetically sealed until used. This handy, popular equipment protects user against carbon monoxide after fire or explosion for at least 30 minutes. Bulletin EC-74.

H-H INHALATOR

Used in conjunction with artificial respiration, the H-H Inhalator speeds effectively the work of resuscitation by supplying correct oxygen-carbon dioxide mixture to the patient's lungs according to demand—gently, naturally, safely. The Instrument is officially accepted by the Council on Physical Medicine of the American Medical Association, approved by the American Gas Association and the Association of Police and Fire Surgeons. Write for descriptive Bulletin CA-9.

M·S·A Chemox OXYGEN BREATHING APPARATUS

Making its own oxygen with a single, replaceable canister as the wearer breathes, Chemox provides a minimum of 45 minutes' respiratory protection in unbreathable air, and is officially approved by the U.S. Bureau of Mines. Simple to use—Chemox supplements other oxygen breathing apparatus types, can be stored underground—and is always ready for immediate use. Bulletin B-14.

M·S·A ALL-SERVICE GAS MASK

Light in weight, comfortable to wear, U. S. Bureau of Mines-approved. Provides protection against gases (including carbon monoxide), fumes and smokes, wherever sufficient oxygen is present in air to support life. Long-lived All-Service canister is quickly replaceable when required—All-Vision facepiece can be put on and adjusted rapidly—sturdy harness contributes to wearing ease. Bulletin EA-8.

Other M.S.A. Rescue Equipment includes: **M.S.A. High Pressure Oxygen Pumps . . . M.S.A. Lifeline Reels . . . M.S.A. Carbon Monoxide Detectors . . . M.S.A. Methane Detectors . . . M.S.A. Methane Testers . . . M.S.A. Wolf Flame Safety Lamps . . . M.S.A. Flame Safety Lamp Test Cabinets . . . M.S.A. Miner's First Aid Cabinets . . . U.S. Army Stretchers . . . M.S.A. Folding Stretcher Outfits . . . M.S.A. Blankets . . . M.S.A. Redi-Heat Block Portable Heat Units . . . Permissible Flash Lights . . . Edison Electric Cap Lamps and Hand Lamps. Write for descriptive information.**

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